PRICE $2.50

MRC-10

TWO-WIRE DATA LINK REMOTE CONTROL SYSTEM

USER'S MANUAL

AND

TROUBLESHOOTING GUIDE

controls, inc.
P.O. Box 894
10 Controls Drive, Shelton, Connecticut 06484

5726

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SERVICE BULLETIN
#123
RECEIVER TEST LIGHT

The receiver test light was designed to be an aid in troubleshooting multiplexed receiver stations. As an aide, it does not replace a volt ohm meter, however in many instances it will be all that is needed to correctly identify a problem in the lower station. The test light should be used in conjunction with the **Trouble Shooting Guide** for your system.

To test the lower station, it must be assumed that the upper station and the data link are operating properly.

The test light will light when a positive voltage is applied to the RED probe. The test light will not test for a (-) grounded output. The test light will not indicate if the voltage present is sufficient to operate a function. Use the test light as follows:

Power On Light on Receiver Does Not Light

1. Test input voltage at relay card. If light does not light, check wiring back to source. If light lights, continue.

2. Test input voltage at receiver input terminal (+). If light does not light, check relay card, relay card fuse, and wiring to relay card. If the light lights, use a volt ohm meter. Voltage should be greater than 9v DC. If not, check back to source. If Power On light fails to come on, send back the receiver to the dealer for repair.

A Switched Output Function Does Not Work

1. Place the test probe on the receiver switched output terminal under test. Turn on the corresponding switched input at the transmitter.

2. Place the test probe on the output function terminal (it must be a positive output) on the relay card. If voltage is present, check the wiring and function being operated. If voltage is not present, the problem is in the wiring to the relay card, the relay, or the relay card.

A Switched Function Comes On Whenever the Receiver Comes On

1. Place the test probe on the receiver switched output terminal. With the switched input off and the receiver Power Out light on, the light should not light. If the light lights, switch to another channel or send back the receiver to dealer for repair.

2. If test light does not light, check relay output terminal. If light lights, replace relay card.

3. Check function being operated. Repair as necessary.

A Proportional Function Does Not Work Properly

1. Place the test probe on the proportional output terminal A or B, corresponding to the problem channel, and operate the controller in the direction being tested. The light should change in intensity as the controller handle is moved. If the light fails to light, first check the controller adjustments. If the light still fails to light, remove the lead to the valve. If the light comes on, repair the valve or wiring to it. If it still does not light and a spare channel is available, switch channels at the transmitter and the receiver. If it still will not light, send the receiver back to the dealer for repair.

2. If the light comes on when the receiver is turned on and the controller is not moved, swap channels with a spare channel if available, or send back to the dealer for repair. 4/0

Rick Torquo

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MRC-10 REMOTE CONTROL SYSTEM

USER'S MANUAL

1. GENERAL INFORMATION

1.1 System Overview

The MRC-10 Remote Control System is designed to allow the operator to control the electro-hydraulic valves of a vehicle from the work platform of the vehicle, or from a nearby remote location. The MRC-10 provides this control by converting the inputs from proportional controllers and switches into digital data, processing and transmitting this data via a pair of shielded wires to the Receiver, then reconverting this data to electrical signals to control the valves and relays. **There is no electrical isolation when shielded wires are used.** The MRC-10 System allows the control of up to five proportional functions along with 11 on/off switch functions, or up to 21 on/off functions alone. Additional proportional functions can be controled, where time sharing permits.

In addition to its control functions, the MRC-10 also allows the user to monitor the amount of time each control function has been used, so that scheduled maintenance may be performed as required.

1.2 System Elements

The MRC-10 Remote Control System is comprised of several distinct components:

1. The Transmitter
2. The Joysticks and Switches
3. The Keypad or Keypad Module
4. The Data Link (shielded wires)
5. The Receiver

A diagram of the MRC-10 Remote Control System is shown in Figure I-I.

1.2.1 The Transmitter

The Transmitter, normally located within the control panel in the work platform, is a microprocessor-based electronic unit which translates the changing input values from the controllers into digital signals which can be used by the computer in the Transmitter. The computer performs several tests on the inputs to be certain that realistic values are coming from the joysticks. The computer also monitors and stores the amount of time that each control has been used. This data, as well as other system information and controls, is accessible by using the Keypad which is located under the Transmitter's cover, or the Keypad Module (KPM-1) which is attached to the Transmitter by a data cable.

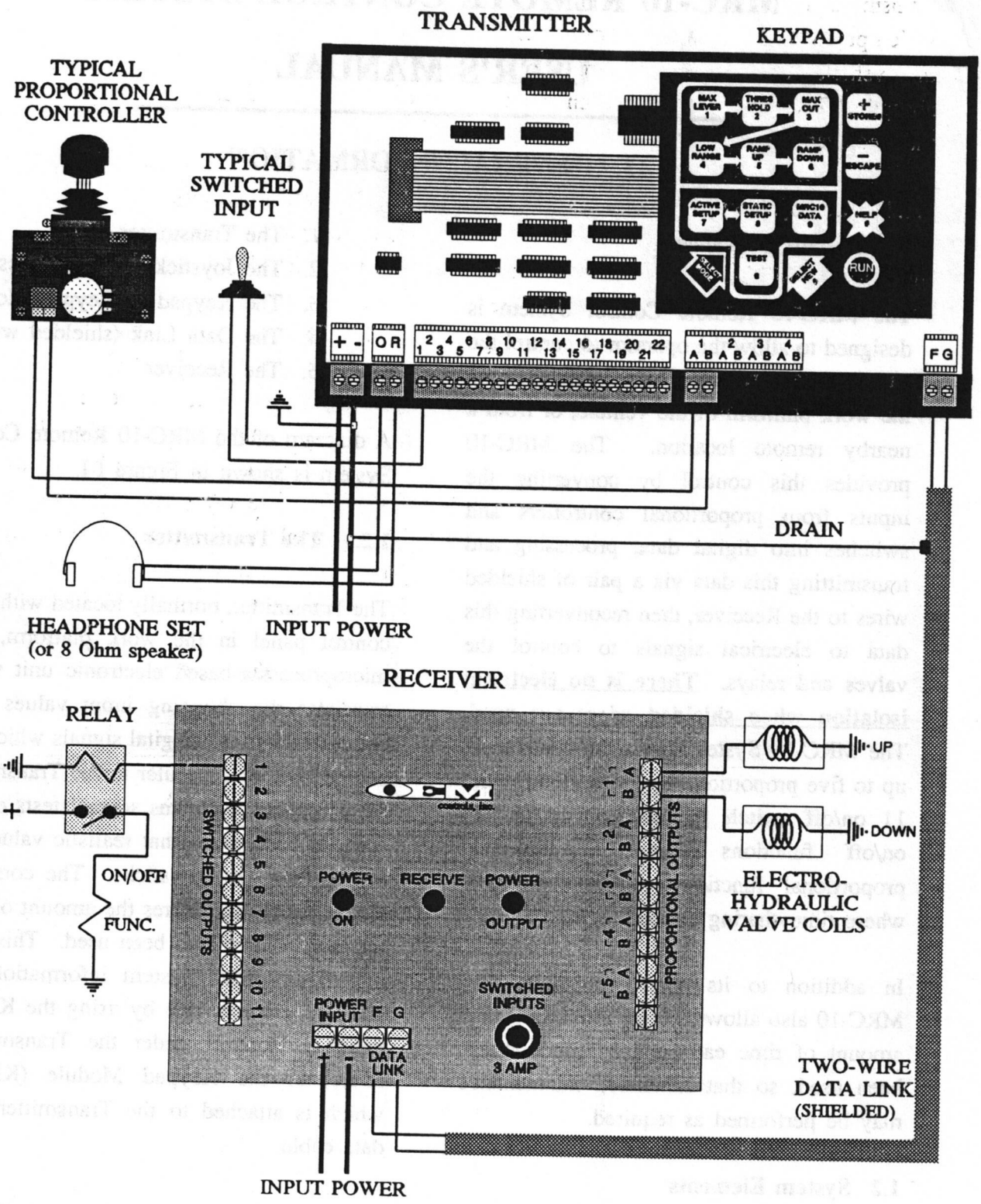


FIGURE I-I MRC-10 TWO-WIRE DATA LINK REMOTE CONTROL SYSTEM

After the data has been verified, the Transmitter introduces the ramping feature, which protects against sudden movement of the vehicle if the controls are moved abruptly. The modified data is then sent to the Receiver via the Data Link.

1.2.2 The Joysticks and Switches

Input to the MRC-10 System comes from Joystick Controllers and from ON\OFF toggle or push-button switches. As mentioned earlier, up to five proportional inputs or as many as 21 switch inputs may be managed.

1.2.3 The Keypad and Keypad Module

The Keypad, which is located under the Transmitter cover, is used to access data stored by the microprocessor, and to customize the actions of the MRC-10 System. It is attached by a flexible ribbon cable, and may be removed from the Transmitter for ease of use. It is usable only if a speaker or headphone set has been connected to the audio connector, the "O" and "R" connector, of the Transmitter; otherwise, there is no method for confirming keypad entry. Neither the Keypad nor an audio output device are needed during normal operation.

In many systems, a connector on the upper control or remote station is provided for use as an interface with the KPM-1 Keypad Module. The KPM-1 includes a Keypad and a headphone set or amplified speaker. The KPM-1 allows easy access to the Keypad features of the Transmitter, without removal of the Transmitter's cover. A drawing of the face of the Keypad, along with an explanation of the more important keys, appears as Figure I-III, located on page 7.

1.2.4 The Data Link

The Data Link connects the Transmitter to the Receiver providing a communications path between them. The Data Link consists of a two-wire shielded cable

1.2.4.1 Two-wire Data Link

In applications where electrical isolation between Transmitter and Receiver is not a requirement, the Data Link is shown in Figure I-I. The wires connect the "F" and "G" terminals of the receiver respectively. The shield (drain wire) is connected ONLY at the Transmitter end. Most typical applications have a "NEGATIVE GROUND" vehicle electrical system. These require the shield to be connected to the "-" terminal of the Transmitter. THE RECEIVER END OF THE SHIELD IS NOT USED AND MUST BE INSULATED TO PREVENT UNWANTED ELECTRICAL CONNECTION.

1.2.5 The Receiver

The Receiver utilizes the digital data it receives via the Data Link to control electro-hydraulic valves and electrical relays and solenoid valves in the vehicle. As the data is received, it is converted into changing electrical current levels which can be used by the valves and relays. Appendix II contains a table of current levels corresponding to the output data.

1.3 System Operation

When in normal use, the Transmitter operates in the RUN Mode. This mode enables the user to control the functions of the vehicle, and does not require the use of an audio device or the Keypad. There are five other modes in which the MRC-10 may operate:

1. ACTIVE SETUP Mode
2. STATIC SETUP Mode
3. TEST Mode
4. DATA Mode
5. SPECIAL Modes

The following sections briefly describe the characteristics and uses for all six operating modes of the Transmitter. More details follow later in this Manual.

1.3.1 RUN Mode

RUN Mode is the normal operating mode of the Transmitter, and will be used much of the time. Whenever power is turned on to the system, it will be in RUN Mode regardless of the mode at shut-off. When in RUN Mode, the Transmitter uses an automatic shut-off feature to conserve power: if no input is received from the controllers or switches for six seconds, the Transmitter will shut down and will remain "off" until an input is activated.

While in RUN Mode, there is no need for the operator to use either the Keypad or an audio device. When in modes other than RUN, access to the Keypad (or use of the Keypad Module) and an audio output device will be required. In other modes the automatic shut-off feature of the Transmitter is disabled.

1.3.2 ACTIVE SETUP Mode

This Mode allows the operator to customize the performance of the system to his own needs or preferences. In ACTIVE SETUP, the controllers are 'live' during the setup process; the vehicle will respond while the setup process is going on. It is possible to change MAX LEVER, THRESHOLD, MAX OUT, LOW RANGE, RAMP UP, and RAMP DOWN settings while in ACTIVE SETUP Mode. More details of the setup process are provided later.

1.3.3 STATIC SETUP Mode

Similar to the ACTIVE SETUP Mode, STATIC SETUP allows the operator to set the six settings mentioned above. However, the controls are inactive during this process, and the functions of the vehicle cannot be operated. Values for the settings are entered directly into the Transmitter via the Keypad.

1.3.4 TEST Mode

TEST Mode provides a quick method for the user to examine system operation. TEST Mode perform the following:

1. Tests Transmitter supply voltage Tests when proportional and ON/OFF Channels are switched ON or OFF
2. Tests Data Link status
3. Test the output level of the proportional controller.
4. Tests the input circuitry of the Transmitter using musical tones
5. Tests Transmitter circuitry
6. Provides a mean of centering the potentiometer.

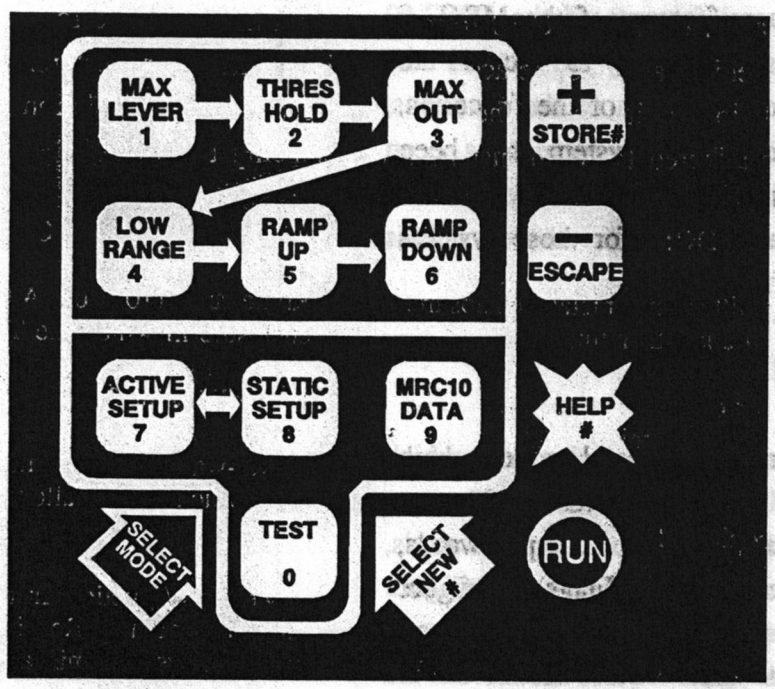
1.3.5 DATA Mode

One of the many features of the MRC-10 Transmitter is its ability to record the amount of time that each of the functions, as well as the overall system, has been operated. This allows the vehicle operator to schedule maintenance for those systems used by each function.

1.3.6 Special Modes

There are a variety of special modes which are employed by the MRC-10 System. These modes allow you to enter passwords, check for system errors (or Flags), configure the system for special uses, and store and retrieve special data. More detail on the uses and operation of all of the special modes will appear throughout this Manual.

KEYPAD



With the exception of SELECT MODE, SELECT NEW # and RUN, each key on the keypad has two functions: red (operation) and blue (numerical).

Some important keys are:

The RUN Key places the MRC-10 System into its normal operating state. The automatic shut-off feature is enabled. The system is ready to be used to control the vehicle.

The SELECT MODE Key changes the operating modes of the MRC-10; it is used to initiate data entry through the Keypad. SELECT MODE makes the red function keys, such as TEST and STATIC SETUP, the active keys.

The SELECT NEW # Key allows numerical entries to be made with the Keypad by making the blue number keys the active keys.

The HELP Key will state the mode or parameter when the function keys are selected, or will state the number stored if the number keys are active.

FIGURE I-II KEYPAD

2. INSTALLATION

Since the installation of the MRC-10 Remote Control System is performed at the site of final assembly of the vehicle and is done according to the vehicle manufacturer's specifications, there are many installation variations. The following is a list of installation "DOs and DON'Ts" which should be adhered to when installing or replacing units of the MRC-10 System.

DO:

Place the Transmitter in metal enclosure, protected from rain and other fluids.

Place weep holes or one-way drain plugs at the bottom of both the Transmitter and Receiver enclosures.

If no Keypad Module will be used, install the Transmitter so that the cover can be removed to gain access to the Keypad.

If a Keypad Module will be used, install the Transmitter to allow sufficient clearance to connect the Keypad Module.

Install the Transmitter so that the connector strip on the front is easily accessible.

Use 18 or 20 gauge shielded, stranded wire when hooking up the MRC-10 System, including the "F" and "G" Data Link connections. The only connection to the shield is made to the "-" terminal of the Transmitter, as shown in Figure I-I. The shield at the Receiver should be wrapped with electrical tape to prevent accidental electrical connection.

Provide strain relief for any wires connected to elements of the system.

Be certain that the Transmitter is electrically shielded by making sure that the shield is mechanically and electrically connected to the Transmitter.

Be sure that the Receiver is solidly connected to frame ground.

Mount Receiver within a protected area.

Be sure the Transmitter (-) and the Transmitter Enclosure are grounded to the upper station enclosure.

DON'T:

Route any 110 Volt A.C. wiring through the enclosure in which the Transmitter is mounted.

Use solid wire for making connections.

Power-wash the Transmitter or Receiver in any way which would allow moisture to enter the units.

Power any function from the switched output terminals of the Receiver other than a coil which draws 250 milliamps or less.

3. INITIALIZATION AND RESET

During the course of operation of the MRC-10 System, there will be times when it will be necessary to initialize or reset the System. This section describes the procedures used to perform the reset operation.

There are three Special Modes, two of which can be reset by the user. It is possible to reset only one or two of them by pressing the MINUS Key to skip the reset process of any mode. The three modes are:

MODE 9998: Operating clocks. Reset of Mode 9998 will cause the time for all individual function and system operating clocks to revert to 0.0 hours. To confirm that this reset has been performed, access the Data Mode; see Section 5 for details.

MODE 9997: Data Tables. Reset of Mode 9997 will cause the set-up parameters such as THRESHOLD and MAX OUT to return to their factory settings.

MODE 9996: Reset at the factory only.

To perform these resets, follow the procedures shown below. If there is a problem while using the procedures, press "RUN" and start again from the beginning. Press the keys as they are shown; the MRC-10 should respond as given. The first part of the procedure puts the system into Mode 9999, the Password-Protect Mode. Reset of individual modes follows:

PERFORM THE FOLLOWING:			***LISTEN FOR RESPONSE:***
Press	SELECT MODE SELECT NEW #		BEEP, BEEP
Press	9 9 9 9		NINE, NINE, NINE, NINE
Press	STORE # ESCAPE		BEEP, BEEP
Press	HELP		MODE IS SPECIAL NUMBER NINE, NINE, NINE, NINE
Enter Password: Press	1 2 3 4 5 6	 	BEEP, BEEP, BEEP BEEP, BEEP, (Long) BEEEEP

To reset all the individual Function and System Operating Clocks (Mode 9998):

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press MINUS		BEEP
Press HELP		MODE IS SPECIAL NUMBER NINE, NINE, NINE, EIGHT
Press SELECT NEW #		BEEP
Press 0		ZERO
Press STORE # ESCAPE		BEEP, BEEP
To stop initialization: Press RUN		BEEP
To Continue initialization: Press MINUS		BEEP

To reset all of the Data Tables (Mode 9997):

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press HELP		MODE IS SPECIAL NUMBER NINE, NINE, NINE, SEVEN
Press SELECT NEW #		BEEP
Press STORE # ESCAPE		BEEP, BEEP
To conclude initialization: Press RUN		BEEP

4. SETUP AND CUSTOMIZATION

The operating parameters of the System, MAX LEVER, THRESHOLD, MAX OUT, LOW RANGE, RAMP UP and RAMP DOWN, are pre-adjusted at the factory with preset values, called the default settings. For optimum vehicle performance, these settings may require fine-tuning. This section describes the procedures for changing the settings of each of the six user-adjustable functions.

These settings can be adjusted in either the ACTIVE SETUP or the STATIC SETUP Mode. If it is desired to perform the adjustments in the ACTIVE SETUP Mode, the operator is cautioned to be in an area clear of obstructions and to be cautious during the setup procedure, as changes in the data can cause sudden motion of the vehicle. It is generally easier to perform the setup procedures in ACTIVE SETUP Mode; it is easier to use the PLUS and MINUS Keys to achieve the desired response. If an exact value is known, it can be entered directly in STATIC SETUP Mode.

All of the adjustment procedures should be performed for both "A" and "B" handle directions on all of the controllers which the user wishes to adjust.

If Keypad Module is used, plug in to MS connector and turn the amplifier on. If Keypad Module is not use, remove the cover of the Transmitter, and remove the Keypad from the case without disconnecting its ribbon cable. Connect a headphone set or a speaker to the "O" and "R" terminal on the Transmitter or to the audio jack on the control box, if so equipped.

QUITE KEY During the press of the SETUP and Customization, there may be times when the responses of the Transmitter would be silence. A special feature has been added to cut short the response when the HELP Key is depress. The QUITE key has no effect in TEST Mode 4 and 6, when the HELP Key is being use as the <#> Number Key.

4.1 MAX LEVER

MAX LEVER tells the Transmitter the maximum handle deflection of a controller. It is set at the factory or at the time of installation, and should not need adjustment again. If it is necessary to adjust MAX LEVER, follow this procedure.

PERFORM THE FOLLOWING:					***LISTEN TO RESPONSE:***
Press	SELECT MODE				BEEP
Press	STATIC SETUP or ACTIVE SETUP		or		BEEP
Press	MAX LEVER				BEEP
Deflect a controller handle **fully** in one direction, then return it to the center position.					BEEP

PREFORM THE FOLLOWING:	***LISTEN TO RESPONSE:***
Deflect the same handle **fully** in one opposite direction, then return it to the center position.	BEEP
Repeat for the controllers are necessary.	
To conclude the MRC LEVER set procedure:	
Press RUN	BEEP

4.2 THRESHOLD

THRESHOLD is the initial current flow to a valve when the controller first turns on, and should be adjusted to the point just below the turn-on point of the valve. To adjust THRESHOLD:

PERFORM THE FOLLOWING:	***LISTEN FOR RESPONSE:***
Press SELECT MODE	BEEP
Press STATIC SETUP or ACTIVE SETUP or	BEEP
Press THRESHOLD	BEEP
Activate the desired controller in the "A" direction.	
Press MRC10 DATA	THRESHOLD THREE, TWO
In ACTIVE SETUP mode: Press PLUS or MINUS or	BEEP
Continue to press "+" or "-" until the THRESHOLD is set just below the initial turn-on level of a function; further activation of a controller should set the function into motion.	
Press MRC10 DATA	THRESHOLD (NUMBER, NUMBER)
Repeat procedure with controller moved in "B" direction.	
In STATIC SETUP mode: Press SELECT NEW #	BEEP
Enter desired value using number keys.	(NUMBER, NUMBER)
Press STORE # ESCAPE	BEEP, BEEP

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press MRC10 DATA		THRESHOLD (NUMBER, NUMBER)
Repeat procedure with controller moved in "B" direction.		
To conclude Setup: Press RUN		BEEP

4.3 MAX OUT

MAX OUT is the maximum current flow to the valve when the handle of the joystick controller is at its fullest deflection. MAX OUT should be adjusted so that the function runs at full speed with the controller handle fully deflected, but starts to slow down as soon as the handle is moved away from full deflection.

To change the MAX OUT setting, perform the same procedure as that for THRESHOLD, just substitute the MAX OUT for THRESHOLD.

4.4 LOW RANGE

LOW RANGE determines the maximum amount of current to be supplied to a valve with the controller at full deflection, and the HIGH/LOW RANGE switch in the 'low' position. The adjustment is identical to that for THRESHOLD and MAX OUT.

If the LOW RANGE function is not used, be sure that the LOW RANGE setting is set for the highest value (127).

4.5 RAMP UP

RAMP UP determines the time it will take to accelerate from THRESHOLD to MAX OUT when the controller handle is moved abruptly. This function prevents sudden, jerky movements of the vehicle. The adjustment of the RAMP UP is identical to that for THRESHOLD. The RAMP UP times are adjustable in .l second steps.

4.6 RAMP DOWN

RAMP DOWN specifies the amount of time it will take to decelerate from MAX OUT to Off when a controller is returned to neutral. The adjustment of the RAMP DOWN function is done in .l second steps in the same manner as that for THRESHOLD.

To save and verify new settings, at the conclusion of setup (ACTIVE or STATIC) press RUN, then operate.

5. USING DATA MODE

As was described in Section 1.3.5, the data storage capabilities are accessible in DATA Mode. This section explains the methods used to retrieve system and individual function operating times.

PERFORM THE FOLLOWING:			***LISTEN FOR RESPONSE:***
Press	SELECT MODE		BEEP
Press	MRC10 DATA		BEEP
Press	SELECT NEW #		BEEP
(REFER TO TABLE V-I)			
Enter the number of the function whose operating time is to be			(NUMBER, NUMBER)
Press	STORE # ESCAPE		BEEP, BEEP
Press	MRC10 DATA		(FUNCTION) HAS BEEN OPERATED (X,X) HOURS
Repeat these steps for other function or step through the entire list.			
Press	PLUS		BEEP
Press	MRC10 DATA		(FUNCTION) HAS BEEN OPERATED (X,X) HOURS
Press	RUN		BEEP

DATA MODE PARAMETER ASSIGNMENTS

PARAMETER NUMBER	FUNCTION ASSIGNMENT
1	MRC-10 TRANSMITTER TOTAL OPERATING TIME
2	TOTAL TIME FOR ALL CONTROLLERS
3	CONTROLLER #1 OPERATING TIME
4	CONTROLLER #2 OPERATING TIME
5	CONTROLLER #3 OPERATING TIME
6	CONTROLLER #4 OPERATING TIME
7	CONTROLLER #5 OPERATING TIME
8	CONTROLLER #6 OPERATING TIME
9	SWITCH #1 OPERATING TIME
10	SWITCH #2 OPERATING TIME
11	SWITCH #3 OPERATING TIME
12	SWITCH #4 OPERATING TIME
13	SWITCH #5 OPERATING TIME
14	SWITCH #6 OPERATING TIME
15	SWITCH #7 OPERATING TIME
16	SWITCH #8 OPERATING TIME
17	SWITCH #9 OPERATING TIME
18	SWITCH #10 OPERATING TIME
19	SWITCH #11 OPERATING TIME
20	SWITCH #12 OPERATING TIME
21	SWITCH #13 OPERATING TIME
22	SWITCH #14 OPERATING TIME
23	SWITCH #15 OPERATING TIME
24	SWITCH #16 OPERATING TIME
25	SWITCH #17 OPERATING TIME
26	SWITCH #18 OPERATING TIME
27	SWITCH #19 OPERATING TIME
28	SWITCH #20 OPERATING TIME
29	SWITCH #21 OPERATING TIME
30	OUTPUT #21 OPERATING TIME
31	OUTPUT #22 OPERATING TIME
32	TRANSMITTER PART# PFO___-2TR
33	SYSTEM PFO___ SOFTWARE VERSION ___
34	NUMBER OF CONTROLLER INPUTS
35	NUMBER OF SWITCH INPUTS/OUTPUTS

FIGURE V-I DATA MODE PARAMETER ASSIGNMENTS

6. SPECIAL OPERATING MODES

In addition to its regular operating modes, the Transmitter is capable of operating in ten Special Modes. Five of these require a password for entry. The purpose and use of these modes is outlined below.

6.1 Password-Protected Modes (1 through 5)

Modes one through five have been designated as Password-Protected Modes. Additionally, Mode One has been assigned to allow the vehicle manufacturer to install interlocks, such as a foot pedal or a motion enable switch. Modes Two through Five are available for password-protected data storage. To enter the Password-Protected Mode:

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press	SELECT MODE SELECT NEW #	BEEP, BEEP
Press	9 9 9 9	NINE, NINE, NINE, NINE
Press	STORE # ESCAPE	BEEP, BEEP
Press	HELP	MODE IS SPECIAL NUMBER NINE, NINE, NINE, NINE
Enter Password: Press	1 2 3 4 5 6	BEEP, BEEP, BEEP
		BEEP, BEEP, (Long) BEEEEP

6.1.1 Mode 1

Mode One allows the user to customize a MRC-10 System for optional equipment installed on the vehicle. The available configurations are:

1 - Standard; no options
2 - Interlock circuit; i.e., a foot pedal or push-button
3 - Motion Enable; i.e., a push-button
4 - Interlock and Motion Enable combination

To determine the configuration in which the MRC-10 is currently operating after password is entered (to check configuration entering password , see 6.3):

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press	PLUS	BEEP
Press	HELP	MODE IS SPECIAL NUMBER ONE
Press	MRC10 DATA	(CONFIGURATION NUMBER)

To change the operating configuration:

Press	SELECT NEW #	BEEP
Enter in the configuration number.		(NUMBER)
Press	STORE # ESCAPE	BEEP, BEEP
Press	MRC10 DATA	(CONFIGURATION NUMBER)
To conclude SPECIAL CONFIGURATION:		
Press	RUN	BEEP

6.1.2 Modes 2 through 5

Modes Two through Five may be used to store password-protected data of up to 12 digits in each mode. After password is entered:

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press	PLUS PLUS	BEEP, BEEP
Press	HELP	MODE IS SPECIAL NUMBER TWO
Press	SELECT NEW #	BEEP
Enter up to 12 digits		(NUMBER)
After all numbers are entered:		BEEP, BEEP

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press STORE # / ESCAPE		(NUMBER)
Press MRC10 DATA		

To access modes three through five:

Press PLUS		BEEP

Once for each mode to advance.

To conclude Password-Protect mode:

Press RUN		BEEP

6.2 Unprotected Modes (6 through 10)

Modes Six through Ten are unprotected modes which can be used to store data in the same manner as Modes Two through Five. These modes can store up to twelve digits. To use these unprotected modes from RUN Mode:

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press SELECT MODE / SELECT NEW #		BEEP, BEEP
Select the mode in which data is to be stored.		(MODE NUMBER)
Press STORE # / ESCAPE		BEEP, BEEP
Press SELECT NEW #		BEEP
Enter up to 12 digits.		(NUMBERS)
Press STORE # / ESCAPE		BEEP, BEEP
Press MRC10 DATA		NUMBERS

To conclude unprotected mode:

Press RUN		BEEP

6.3 Data Retrieval

Data entered in either the Password-Protected or the Unprotected Modes may be retrieved easily without entering a password. From RUN Mode:

PERFORM THE FOLLOWING:			***LISTEN FOR RESPONSE:***
Press	SELECT MODE SELECT NEW #		BEEP, BEEP
Select the mode from data is the retrieved (one through ten) by pressing a number key.			(MODE NUMBER)
Press	STORE # ESCAPE		BEEP, BEEP
Press	MRC10 DATA		(NUMBERS)
To conclude data retrieval:			
Press	RUN		RUN

7. USING TEST MODE

This section explains how to access and used parameters in TEST Mode. The TEST Mode provides a mean to test the following.

Currently available TEST Mode are:

1 - Reports Transmitter supply voltage. Reports status of proportional and ON/OFF Channels. When activated, reports whether ON or OFF.
2 - Reports Data Link Status
3 - Reports the output level of the proportional controllers.
4 - Performs a check of the input circuitry of the Transmitter, using musical tones.
5 - Special Mode used to check the Transmitter circuitry.
6 - Provides a mean of centering the potentiometer, when the Potentiometer Circuit Board is replaced.

To access the test parameter:

PERFORM THE FOLLOWING:			***LISTEN FOR RESPONSE:***
Press	SELECT MODE		BEEP
Press	TEST		BEEP
Press	HELP		MODE IS TEST. PARAMETER IS ONE
Press	MRC10 DATA		THE SUPPLY VOLTAGE IS (X.X) VOLTS
Press	PLUS		BEEP
Press	HELP		MODE IS TEST PARAMETER IS TWO
Press	MRC10 DATA		TWO-WIRE DATA LINK O.K. OR TWO-WIRE DATA LINK NOT CONNECTED, CHECK F AND G TERMINAL WIRING
Press	PLUS		BEEP
Press	HELP		MODE IS TEST, PARAMETER IS THREE

PERFORM THE FOLLOWING:	***LISTEN FOR RESPONSE:***
Activate controller.	CONTROLLER (X) (A, B) ON CONTROLLER (X) (A, B) OFF
Activate Switches.	SWITCH INPUT (X) ON SWITCH INPUT (X) OFF
Activate a Controller	CONTROLLER (X) (A, B) ON
Press MRC10 DATA	OUTPUT LEVEL (1 to 127)
Controller to neutral.	CONTROLLER (X) (A, B) OFF
Repeat for other Controllers.	OUTPUT LEVEL (1 to 127)
Return Controller to neutral.	CONTROLLER (X) (A, B) OFF
Press PLUS	If two-wire link is good: TWO-WIRE LINK O.K. CHECK DIGITALS
Press HELP	MODE IS TEST, PARAMETER IS FOUR Range Test Here.
Remove the switch input connector strip.	
Connect one end of jumper wire to the "+" Terminal.	
Touch the other end of the wire of the 21 switch input connectors on the Transmitter.	Ascending musical tones. Missed tone means as bad input. After all inputs have been tested: DIGITALS O.K. CHECK ANALOGS
Move controller handle in "A" direction, then return to neutral.	Ascending higher-pitched scale Descending higher-pitched scale
Move controller handle in "B" direction, then return to neutral.	Descending lower-pitched scale Ascending lower-pitched scale
Repeat for other controllers.	After all are complete: ANALOGS O.K. MRC-10 O.K.
Press PLUS	BEEP
Press HELP	MODE IS TEST, PARAMETER IS FIVE
Activate Controller	

PERFORM THE FOLLOWING:		***LISTEN FOR RESPONSE:***
Press MRC10 DATA		If OK will give a number between 121 and 135
Repeat in reverse direction Repeat for each controller		
Press PLUS		BEEP
Press HELP		MODE IS TEST, PARAMETER IS SIX Center pot here.

Mechanically center the Potentiometer and affix it to the controller, Without moving the controller handle, Close the S1 Microswitch on the controller. The Potentiometer is electrically centered when no tone is heard. Adjust the trimpot to lower the tone, when no tune is heard continue to adjust 1/2 turn more.

To conclude TEST mode:

Press RUN		

MRC-10 REMOTE CONTROL SYSTEM

TROUBLESHOOTING GUIDE

HARD-WIRE SYSTEMS

8. GENERAL INFORMATION

8.1 Introduction

This Troubleshooting Guide is designed for use by personnel at the job site; it is intended to aid a repair person in isolating problems to the faulty unit of the MRC-10 System, so that the unit can be replaced. It is not intended as a complete repair manual; faulty units should be returned to the dealer for servicing by qualified technicians.

As an aid to fault isolation, the MRC-10 Transmitter and Receiver have a set of diagnostic Light Emitting Diodes (LEDs): three on the Receiver, and two beneath the Keypad in the Transmitter. These LEDs are used to determine whether the units are supplied with power and inputs, whether the Data Link is O.K., and whether there is output to the relays and valves of the vehicle. The positions of the LEDs, and of the system connections, are shown in Figure VIII-I.

In addition to the LED indicators, the Transmitter also makes use of features provided by the microprocessor, such as TEST Mode, which is discussed in detail in Section 7 of the User's Manual. The microprocessor can also speak a number of helpful messages, which are listed completely in Appendix II.

8.2 Required Tools

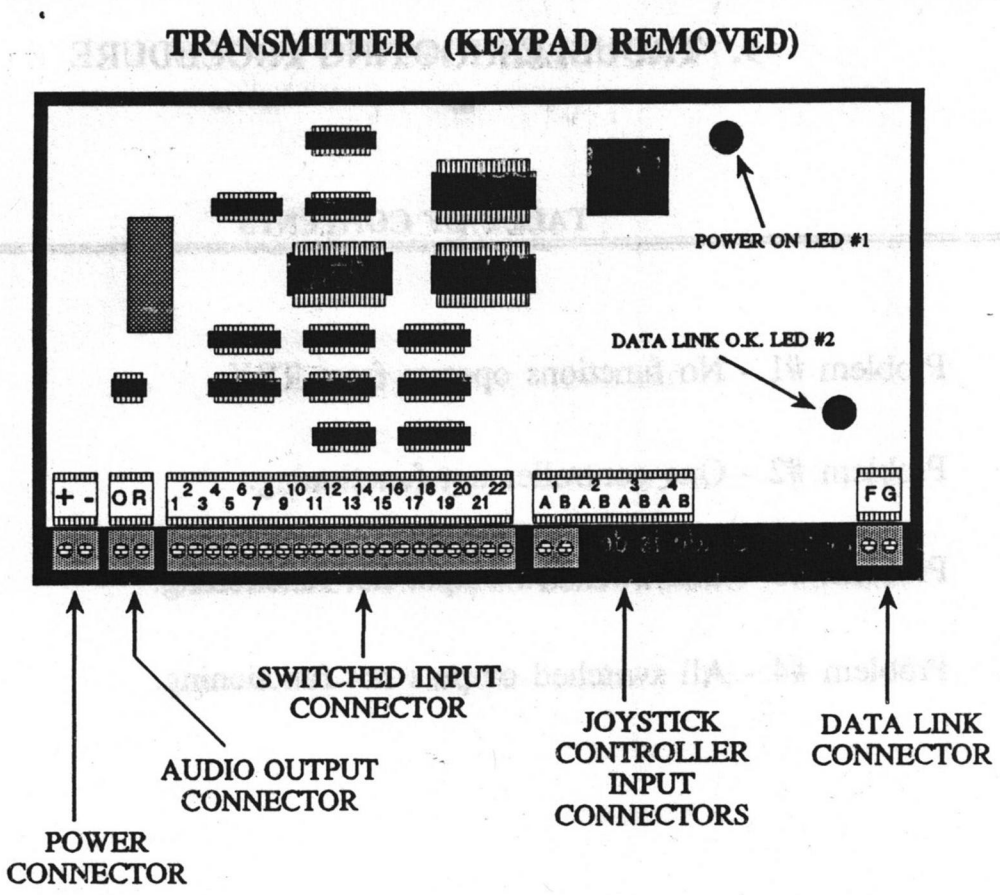
To complete the troubleshooting procedures, the following tools and devices will be required:

- A flat-blade screwdriver
- A set of headphones or a speaker
- A voltmeter
- A pair of long jumper wires
- A pair of short jumper wires

8.3 How to use this Guide

The troubleshooting procedures of this Guide are presented in the form of a "yes/no" decision tree, and will allow a technician with moderate experience to quickly and consistently locate problems with the MRC-10 System.

Whenever a problem is detected in the operation of the controls of the vehicle, start with the first block of the tree, and answer each question, proceeding to other blocks until the problem is located. Where more information may be required, references to the User's Manual have been provided. If, for some reason, the end of the Tree is reached, and the problem has not been located, start over, checking each test again. If the problem can not be found after a second attempt, please contact the dealer for further information.



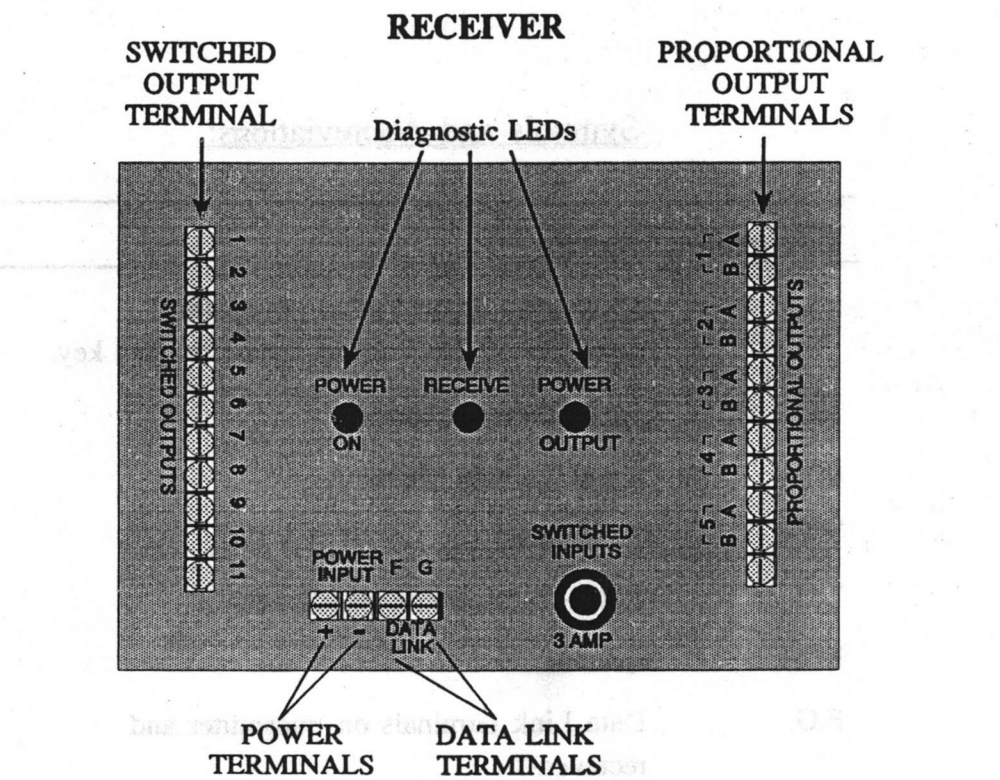


FIGURE VIII-I TRANSMITTER AND RECEIVER: LEDs and Connections

9. TROUBLESHOOTING PROCEDURE

TABLE OF CONTENTS

1 Problem #1 - No functions operate from TRX.

2 Problem #2 - One controller not functioning.

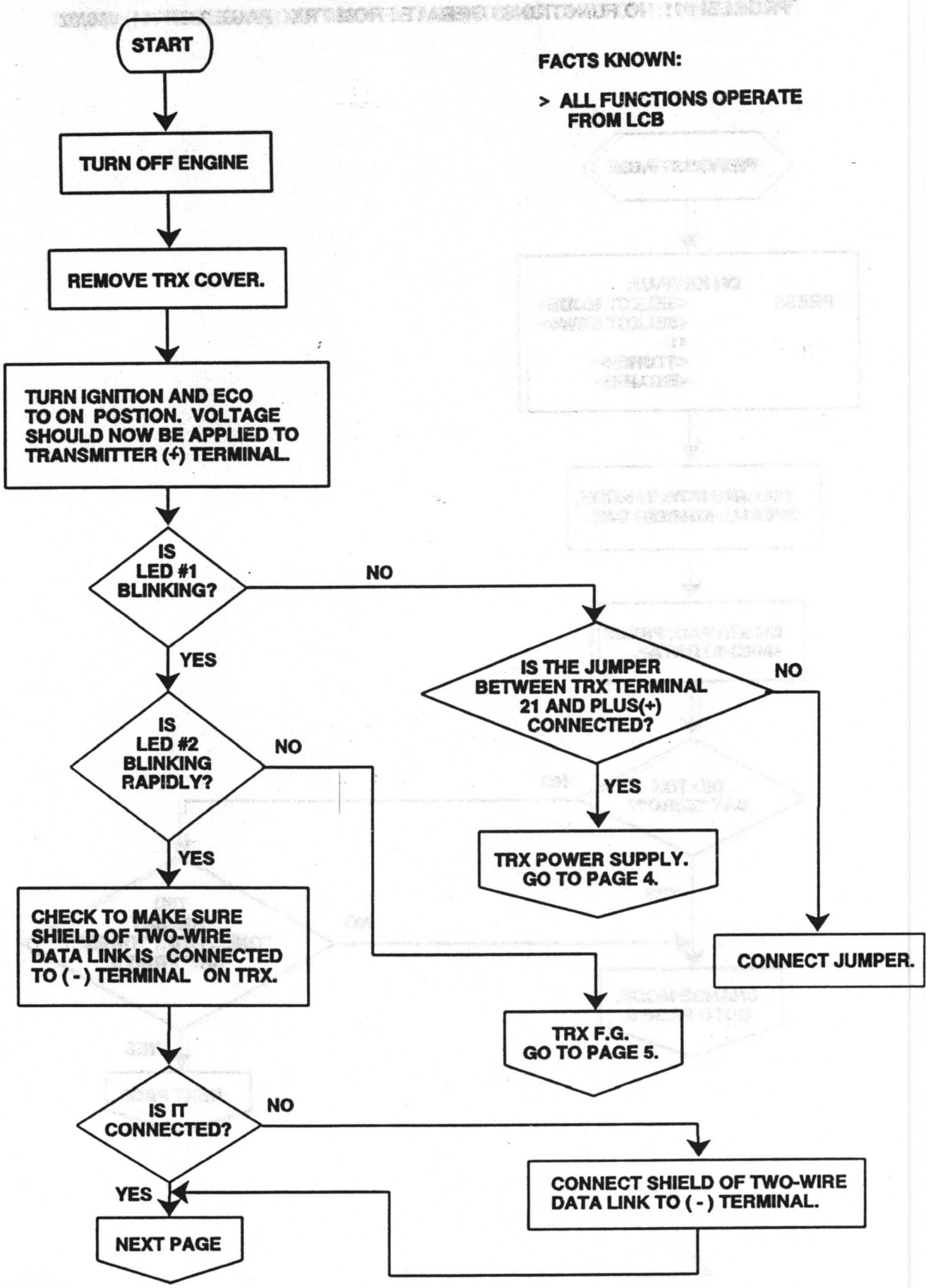
3 Problem #3 - One switched output not functioning.

4 Problem #4 - All switched outputs not functioning.

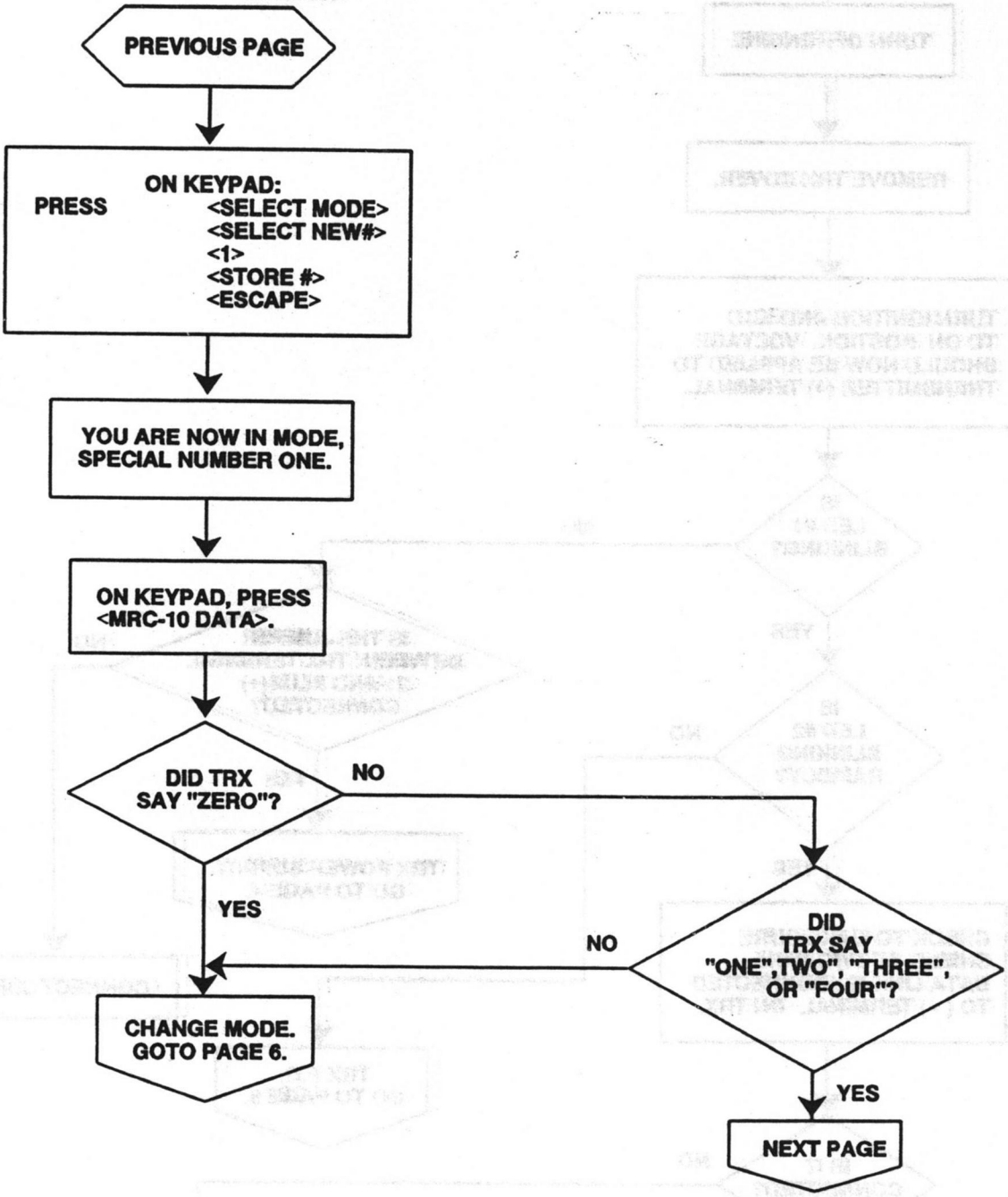
Symbols and Abbreviations:

Convention	Meaning
<...>	Indicates a keypad key to be pressed. Example: <RUN> means press the run key.
LED	Light Emitting Diode.
DVM	Digital Voltage Meter.
TRX	Transmitter.
"..."	MRC-10 transmitter voice output.
RCX	Receiver
F.G.	Data Link terminals on transmitter and receiver.
LCB	Lower Control Box

PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 1 OF 11) 07/02/92



PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 2 OF 11) 4/30/92



PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 3 OF 11) 4/30/92

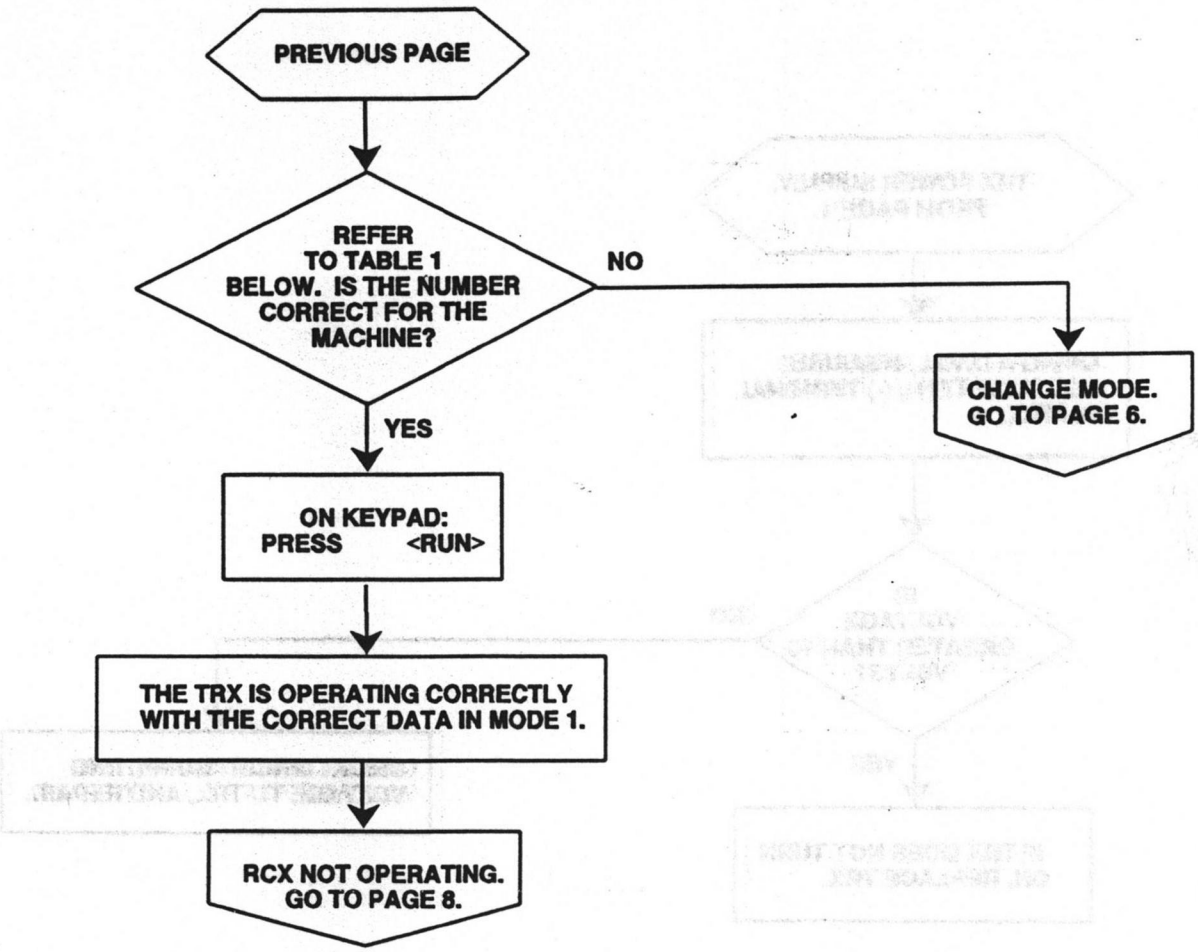
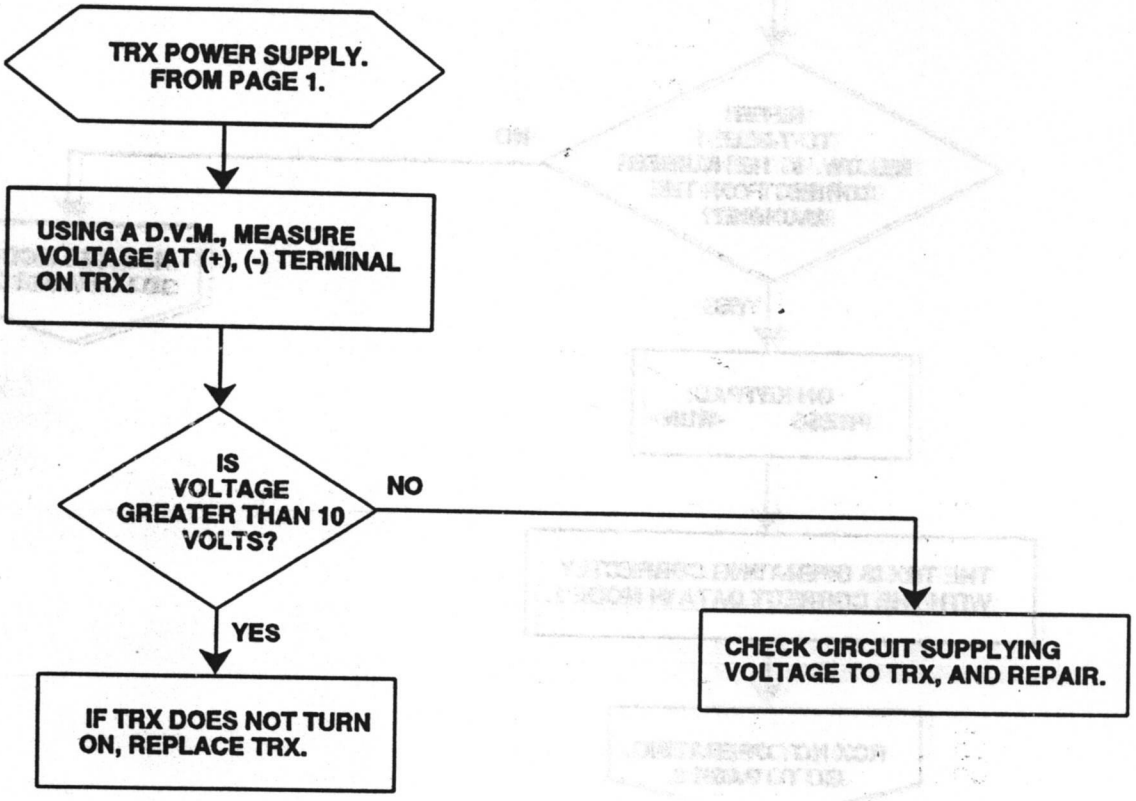


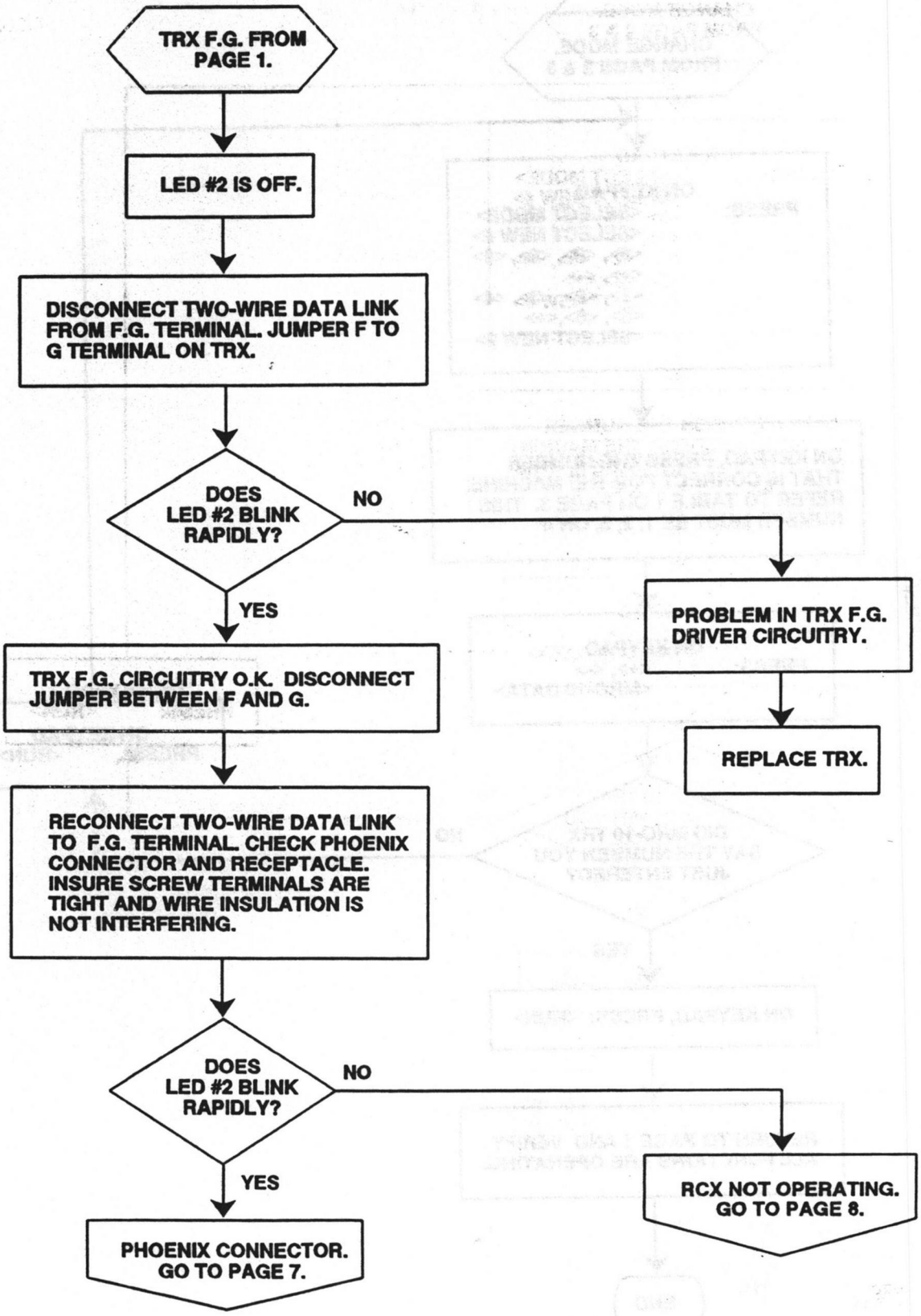
TABLE 1

MODE 1 DATA	APPLICATION
0.....	NO DATA TRANSMITTED.
1.....	TRANSMITTER.
2.....	TRANSMITTER WITH FOOT PEDAL.
3.....	TRANSMITTER WITH MOTION ENABLE.
4.....	TRANSMITTER WITH MOTION ENABLE AND FOOT PEDAL.

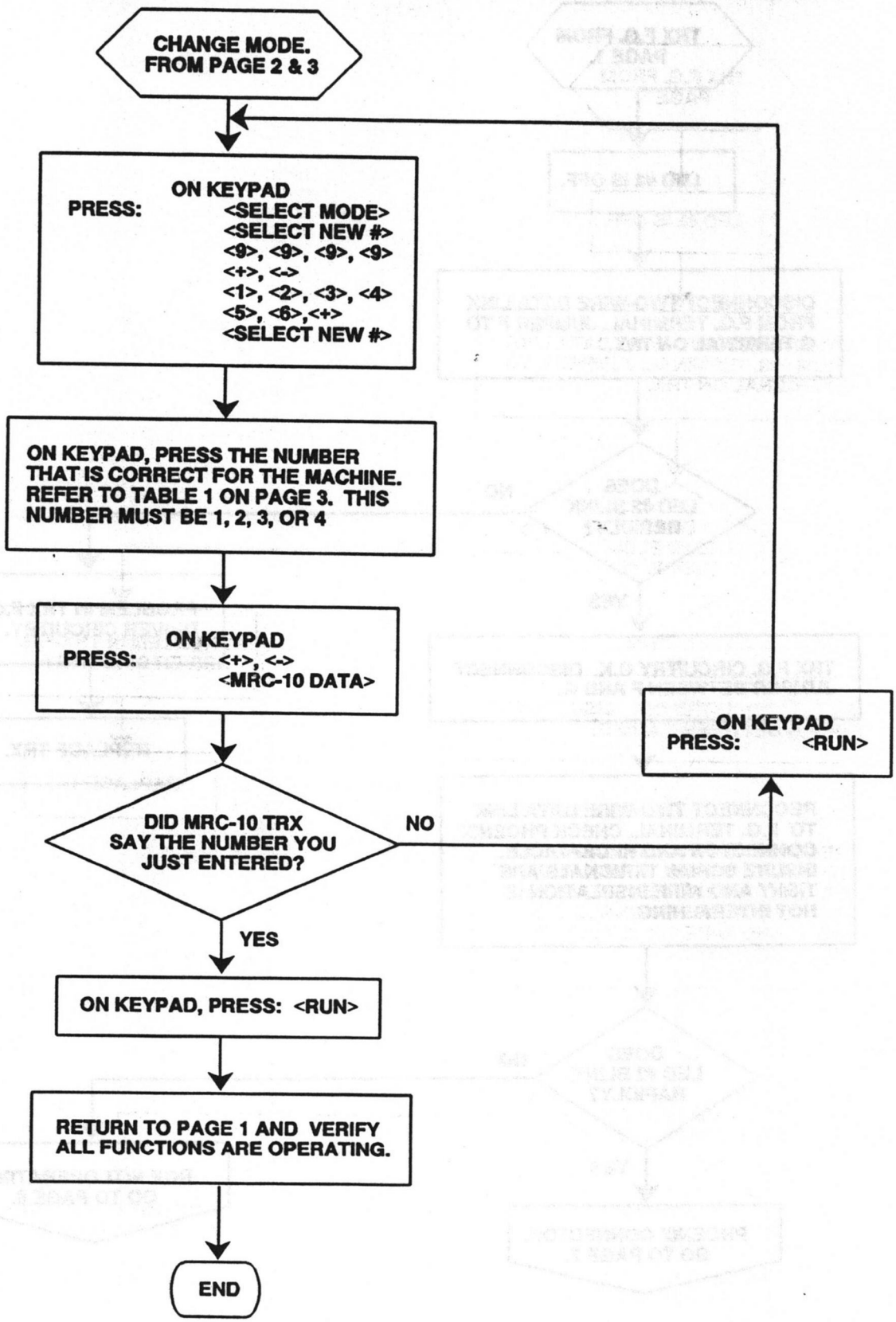
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 4 OF 11) 4/30/92



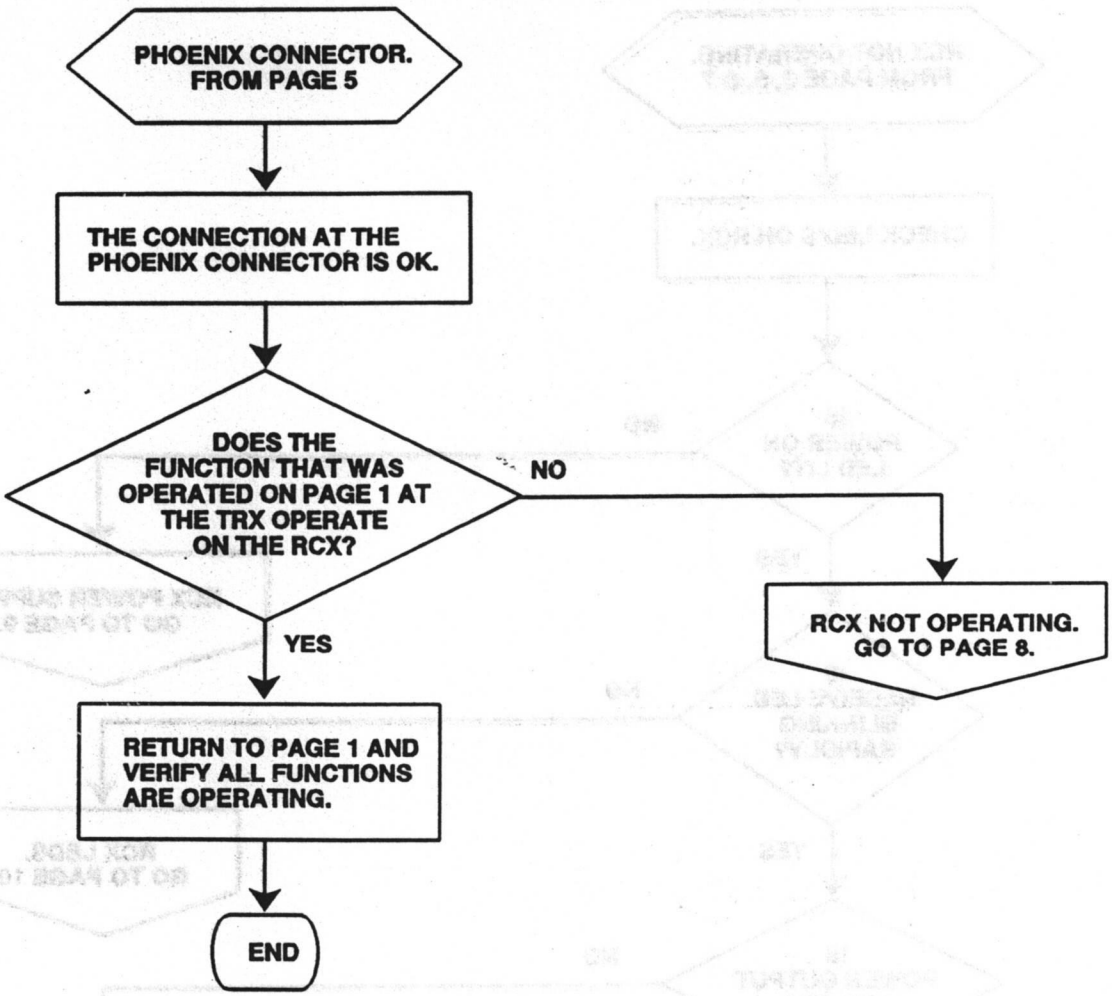
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 5 OF 11) 4/30/92



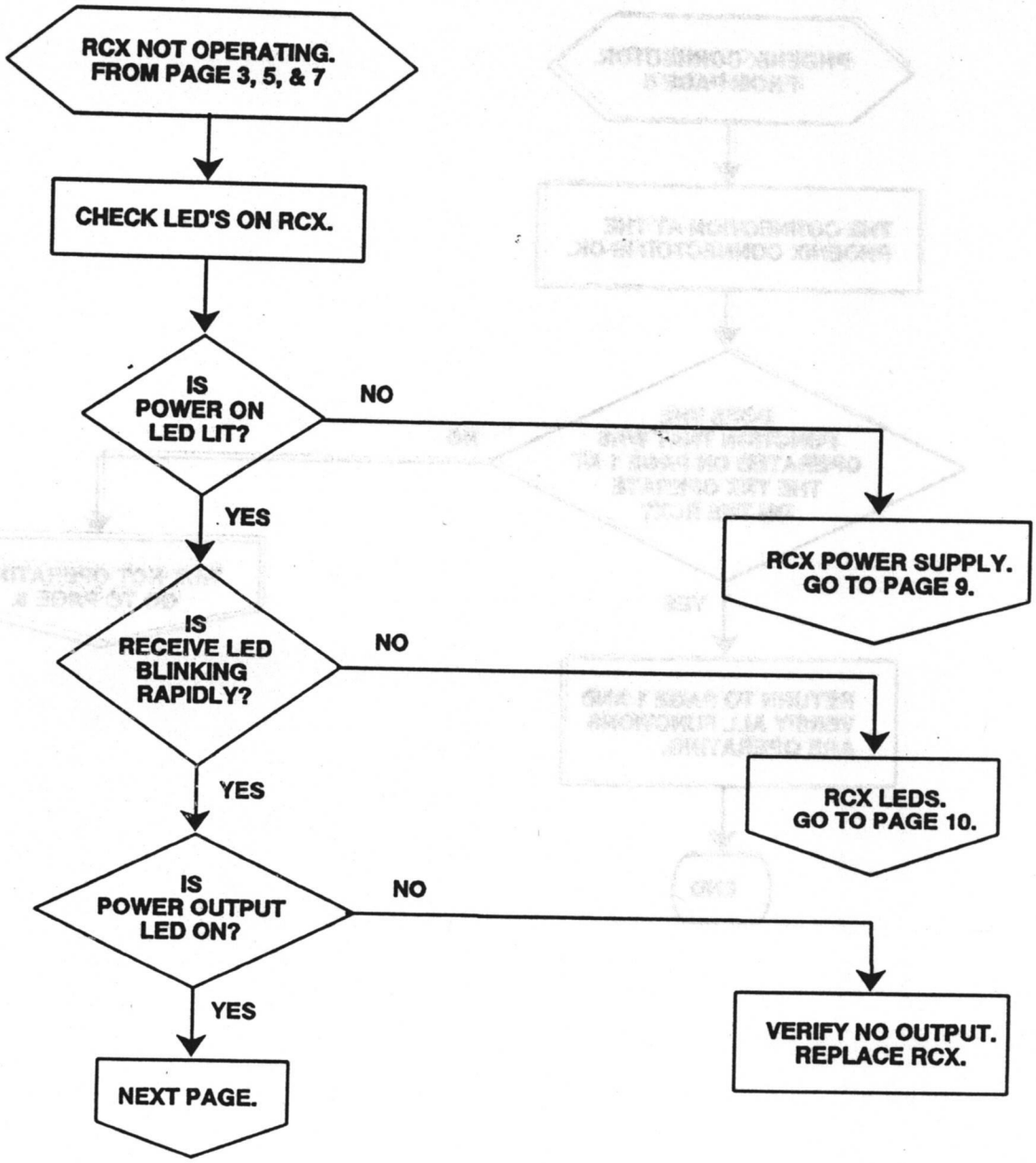
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 6 OF 11) 4/30/92



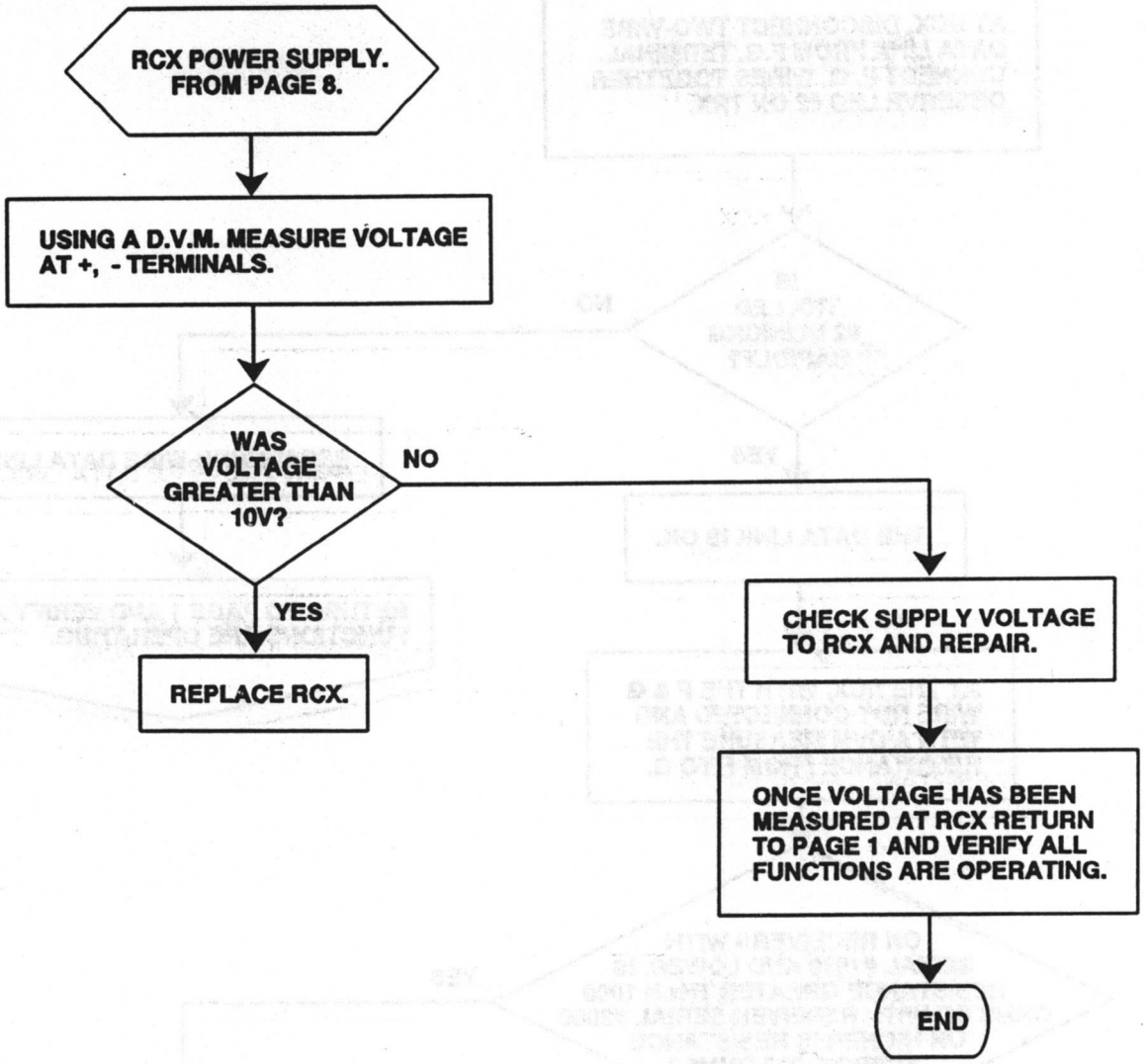
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 7 OF 11) 4/30/92



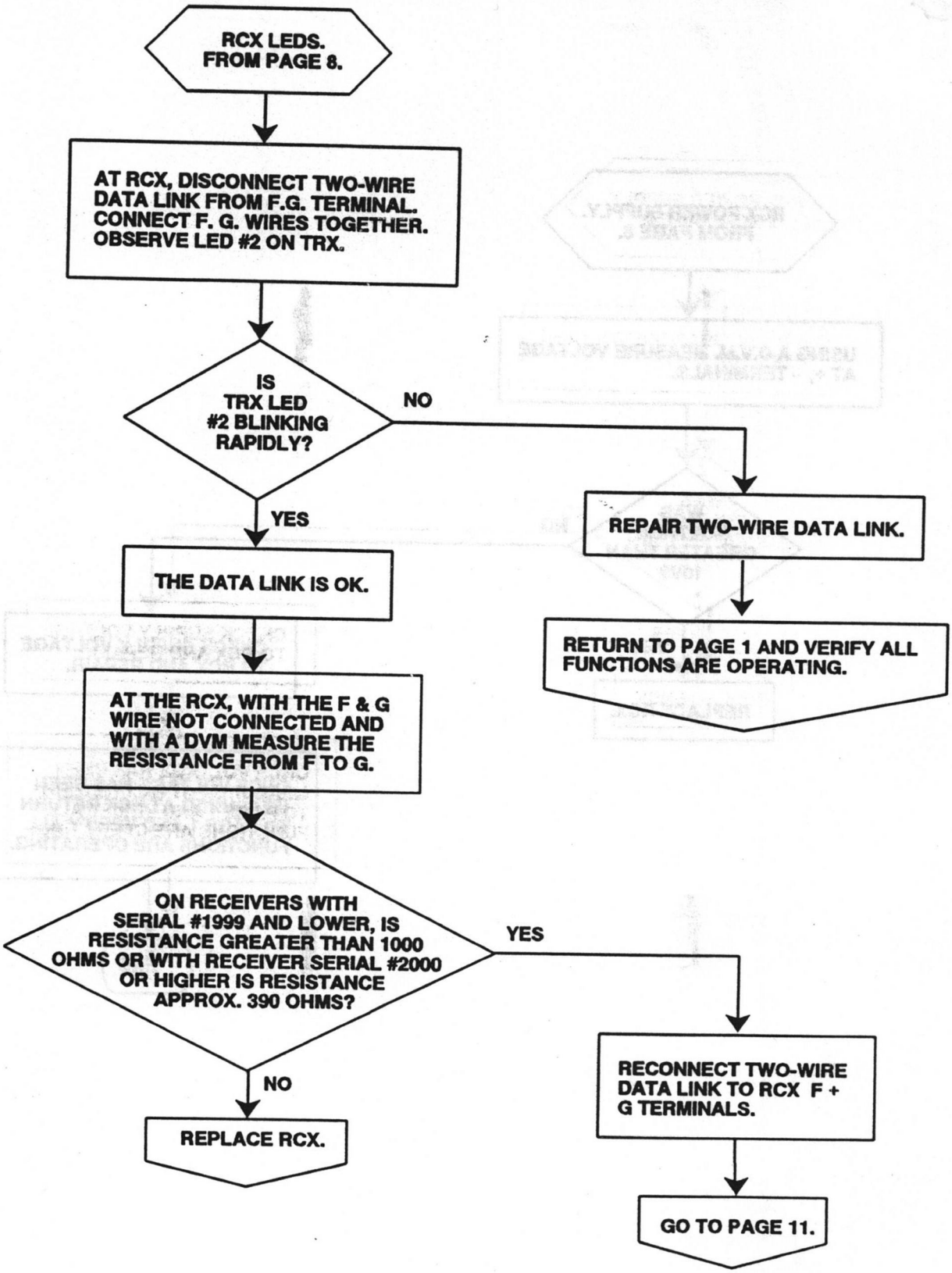
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 8 OF 11) 07/02/92



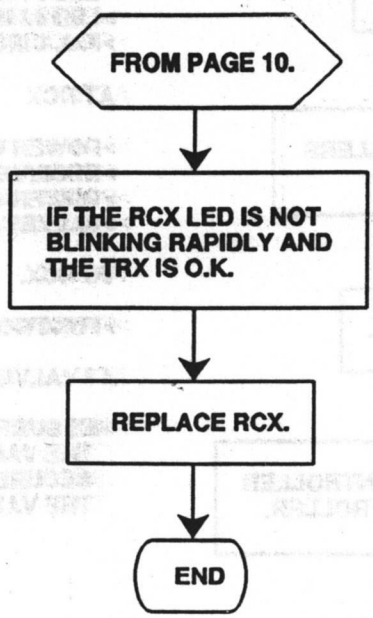
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 9 OF 11) 4/30/92



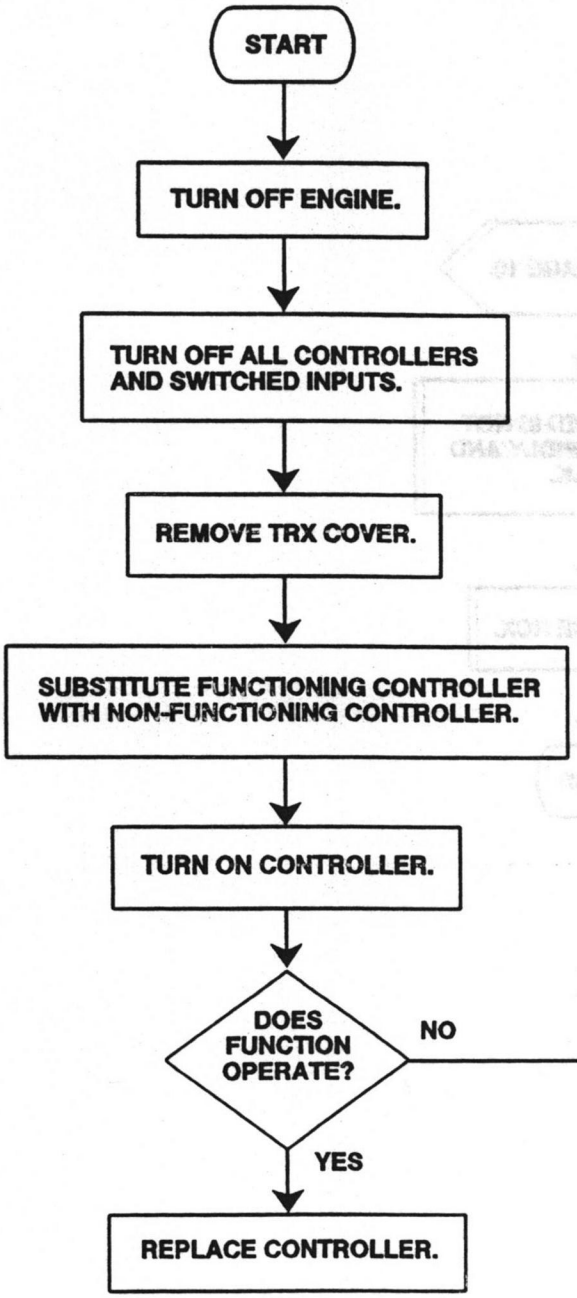
PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 10 OF 11) 4/30/92



PROBLEM #1: NO FUNCTIONS OPERATE FROM TRX (PAGE 11 OF 11) 4/30/92



PROBLEM #2: ONE CONTROLLER NOT FUNCTIONING (PAGE1 of 4) 4/30/92



FACTS KNOWN:

AT TRX

>OTHER SWITCHES AND CONTROLLERS ARE FUNCTIONING.
>LED #1 IS BLINKING.
>LED #2 IS BLINKING RAPIDLY.
>F.G. CIRCUITRY IS OK.

AT RCX

>POWER ON LED IS ON.
>RECEIVE LED BLINKING RAPIDLY.
>POWER OUT LED IS ON.
>VALVES ARE LEFT CONNECTED.

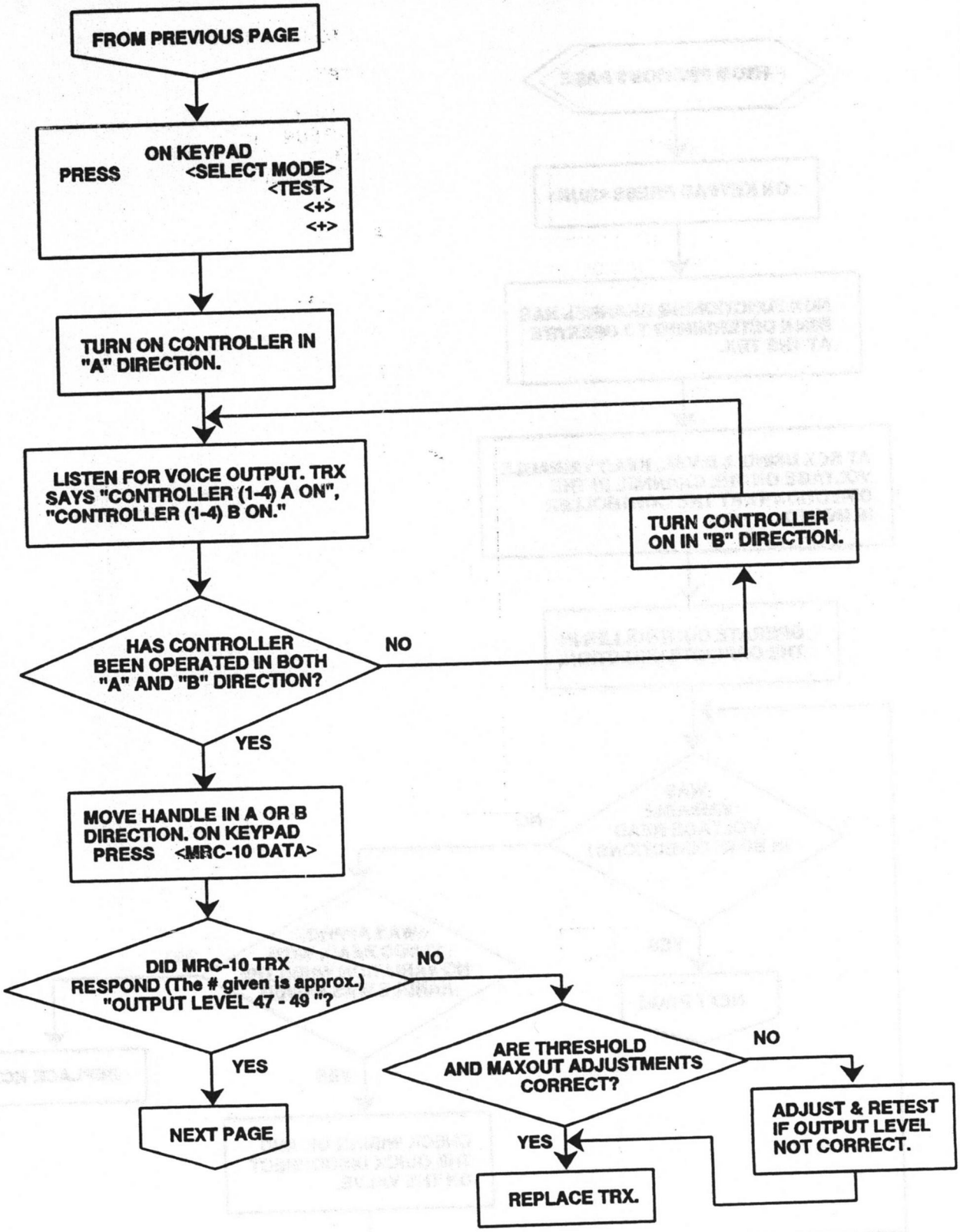
TO RCX.

>FUNCTION OPERATES AT LCB.

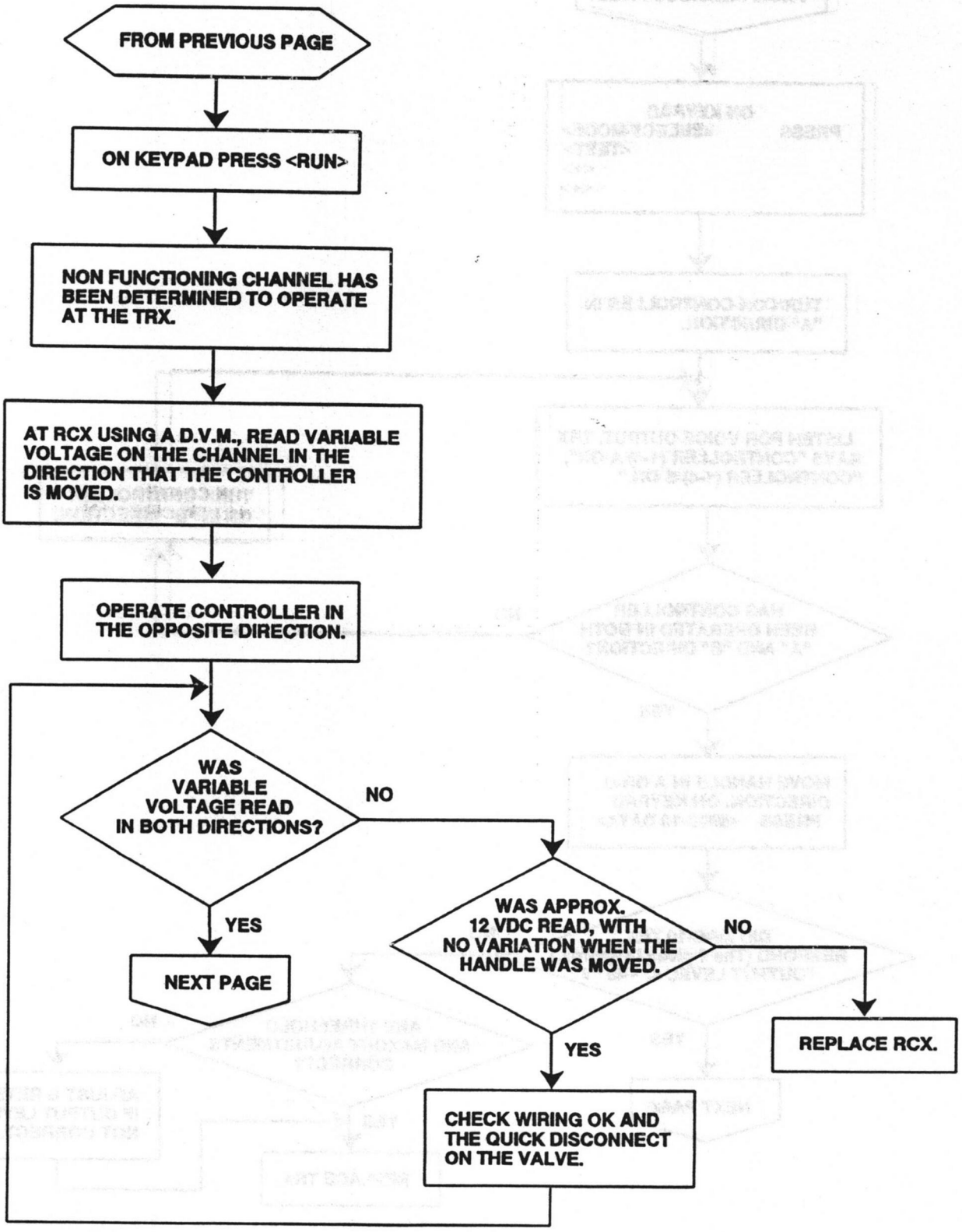
AT VALVE

>BE SURE THAT THE WIRE CONNECTION TO THE VALVE VIA THE QUICK DISCONNECT IS SECURE AND MAKES GOOD CONTACT WITH THE VALVE TERMINAL.

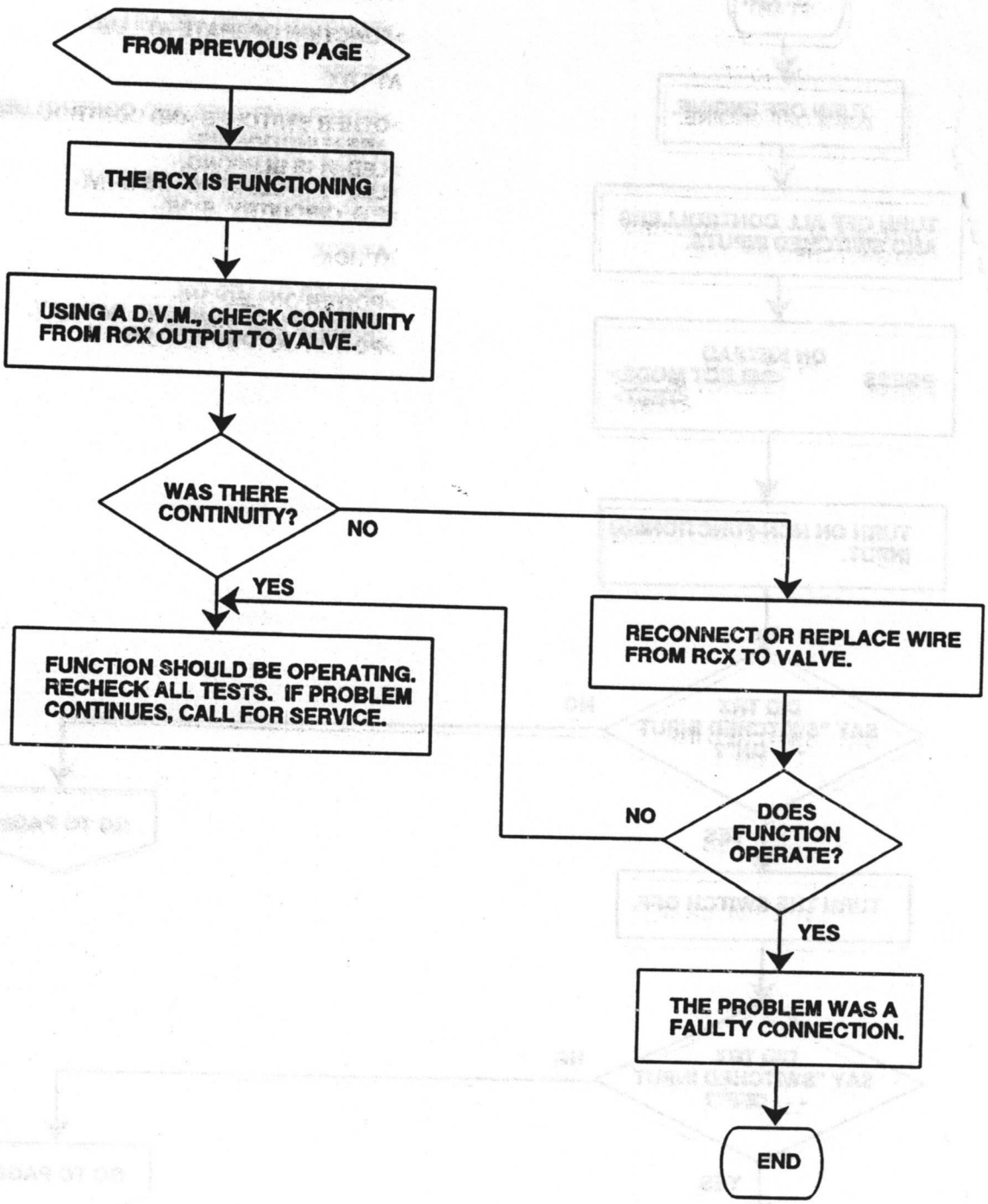
PROBLEM #2: ONE CONTROLLER NOT FUNCTIONING (PAGE 2 of 4) 4/30/92



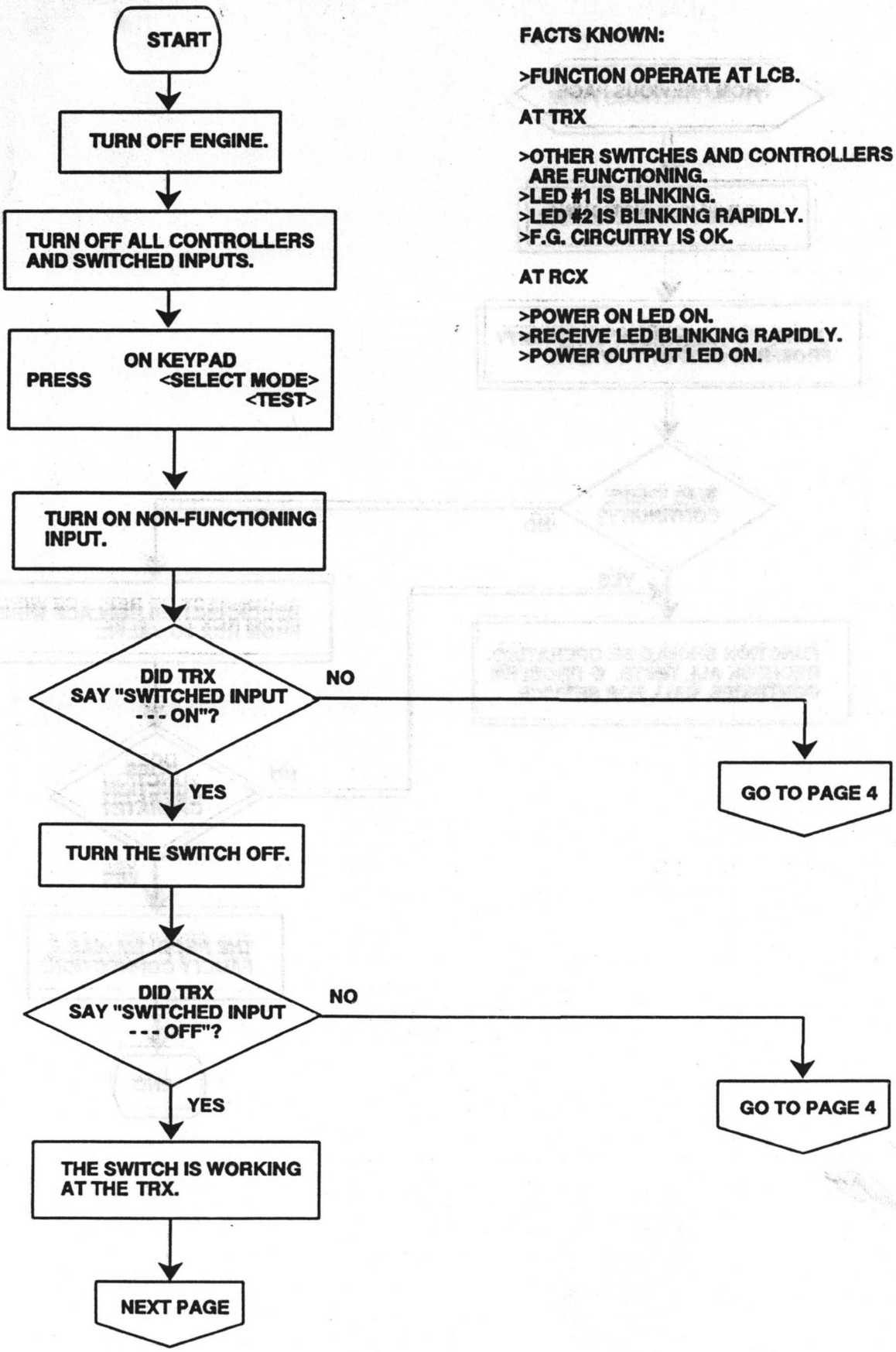
PROBLEM #2: ONE CONTROLLER NOT FUNCTIONING (PAGE 3 OF 4) 4/30/92



PROBLEM #2: ONE CONTROLLER NOT FUNCTIONING (PAGE 4 OF 4) 4/30/92



PROBLEM #3: ONE SWITCHED OUTPUT NOT FUNCTIONING (PAGE 1 of 5) 07/02/92



FACTS KNOWN:

>FUNCTION OPERATE AT LCB.

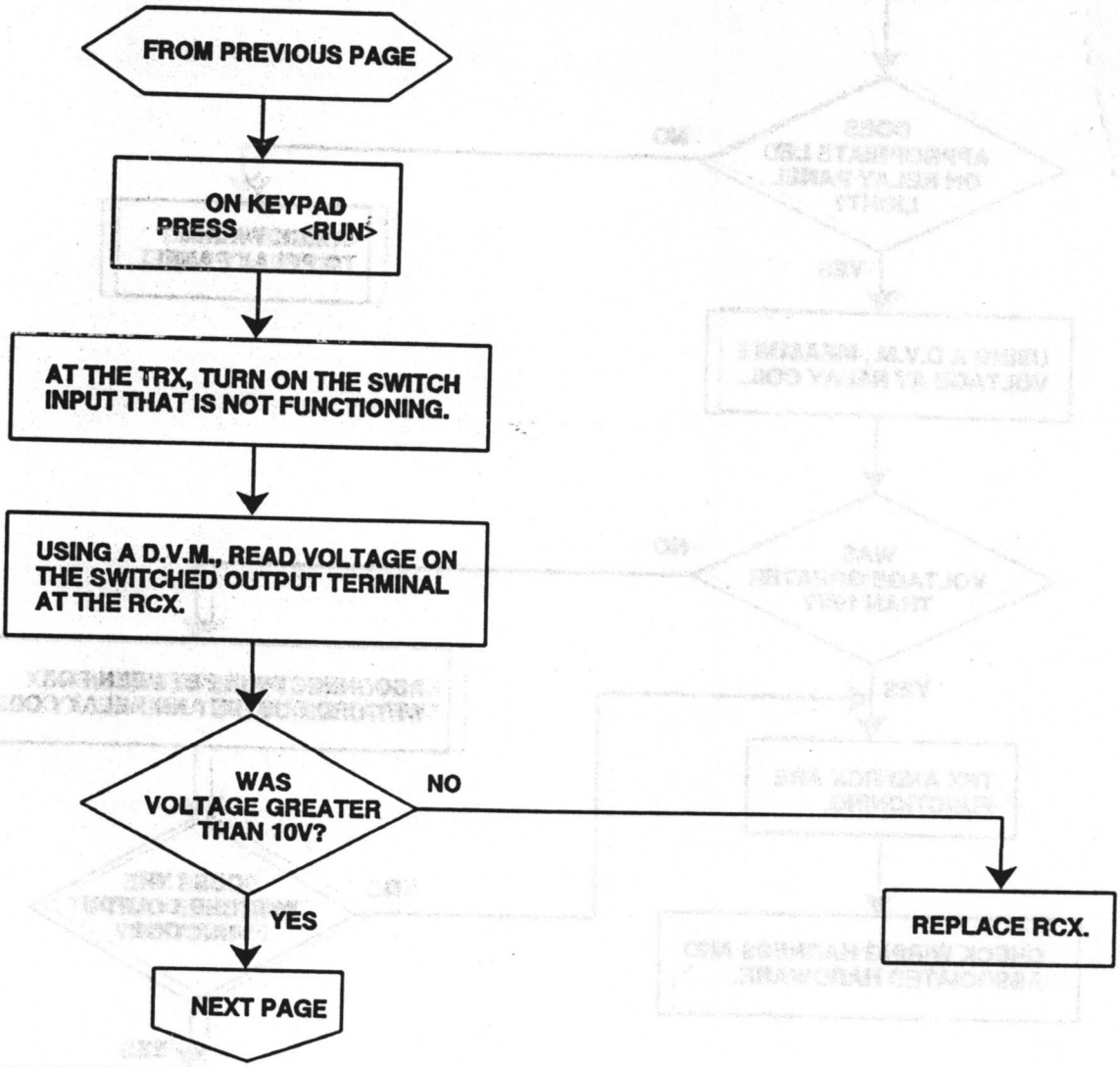
AT TRX

>OTHER SWITCHES AND CONTROLLERS ARE FUNCTIONING.
>LED #1 IS BLINKING.
>LED #2 IS BLINKING RAPIDLY.
>F.G. CIRCUITRY IS OK.

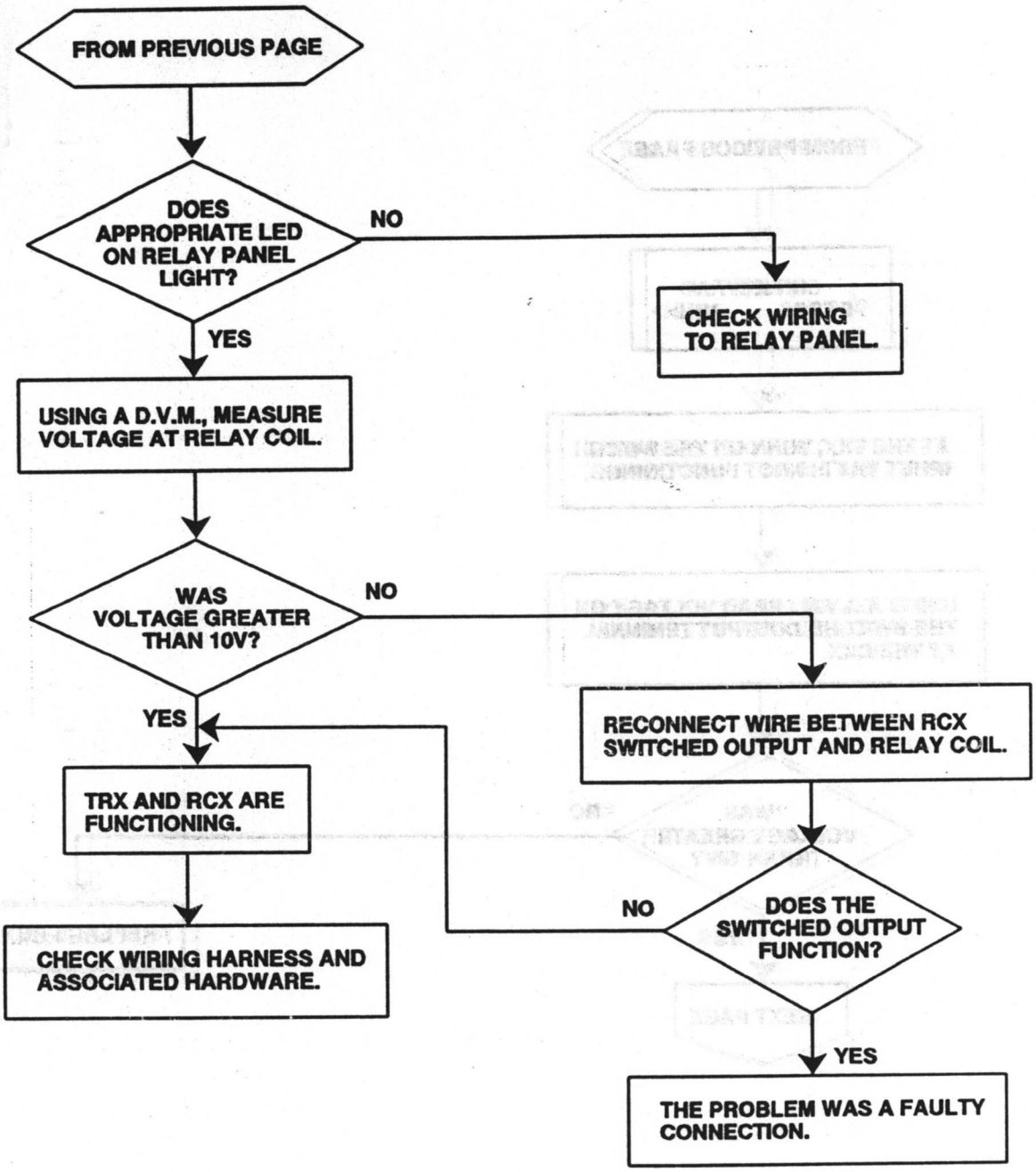
AT RCX

>POWER ON LED ON.
>RECEIVE LED BLINKING RAPIDLY.
>POWER OUTPUT LED ON.

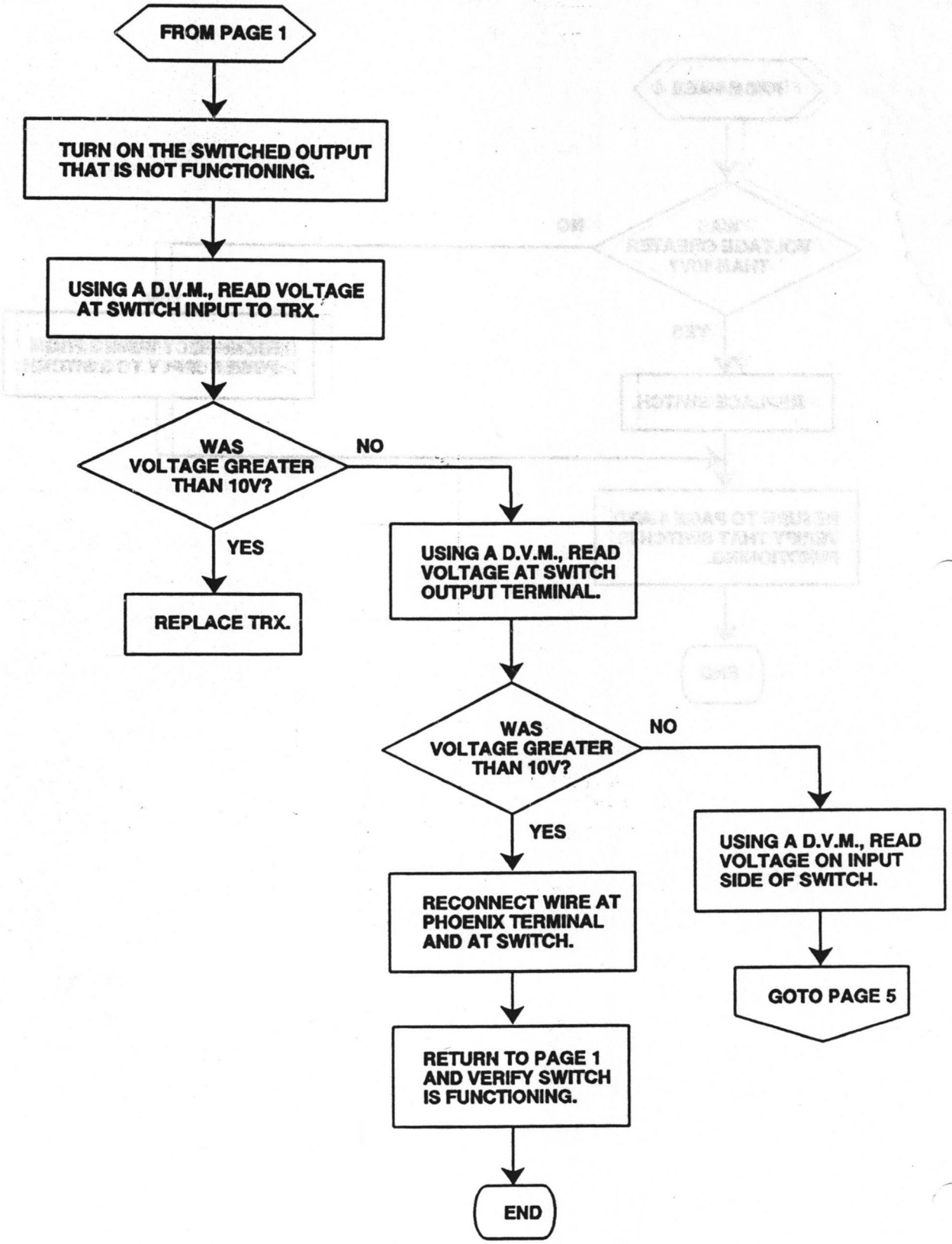
PROBLEM #3: ONE SWITCHED OUTPUT NOT FUNCTIONING (PAGE 2 of 5) 4/30/92



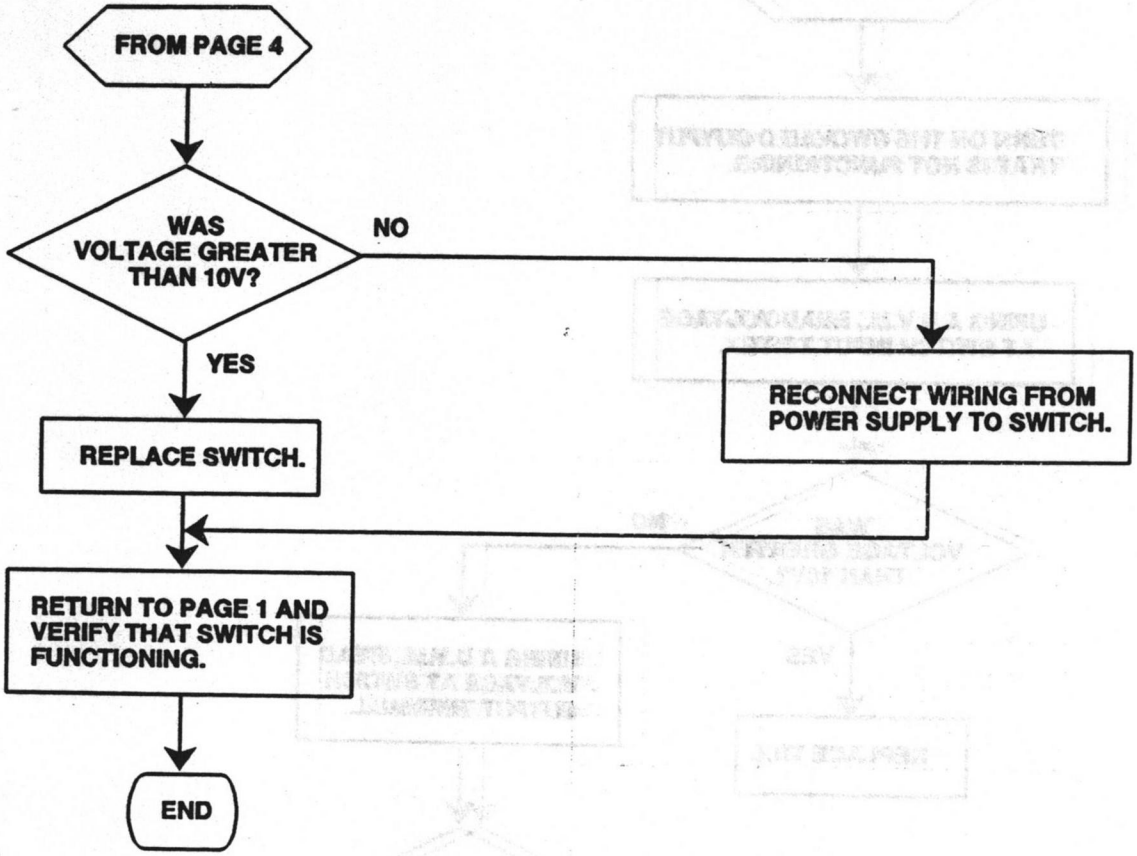
PROBLEM #3: ONE SWITCHED OUTPUT NOT FUNCTIONING (PAGE 3 of 5) 4/30/92



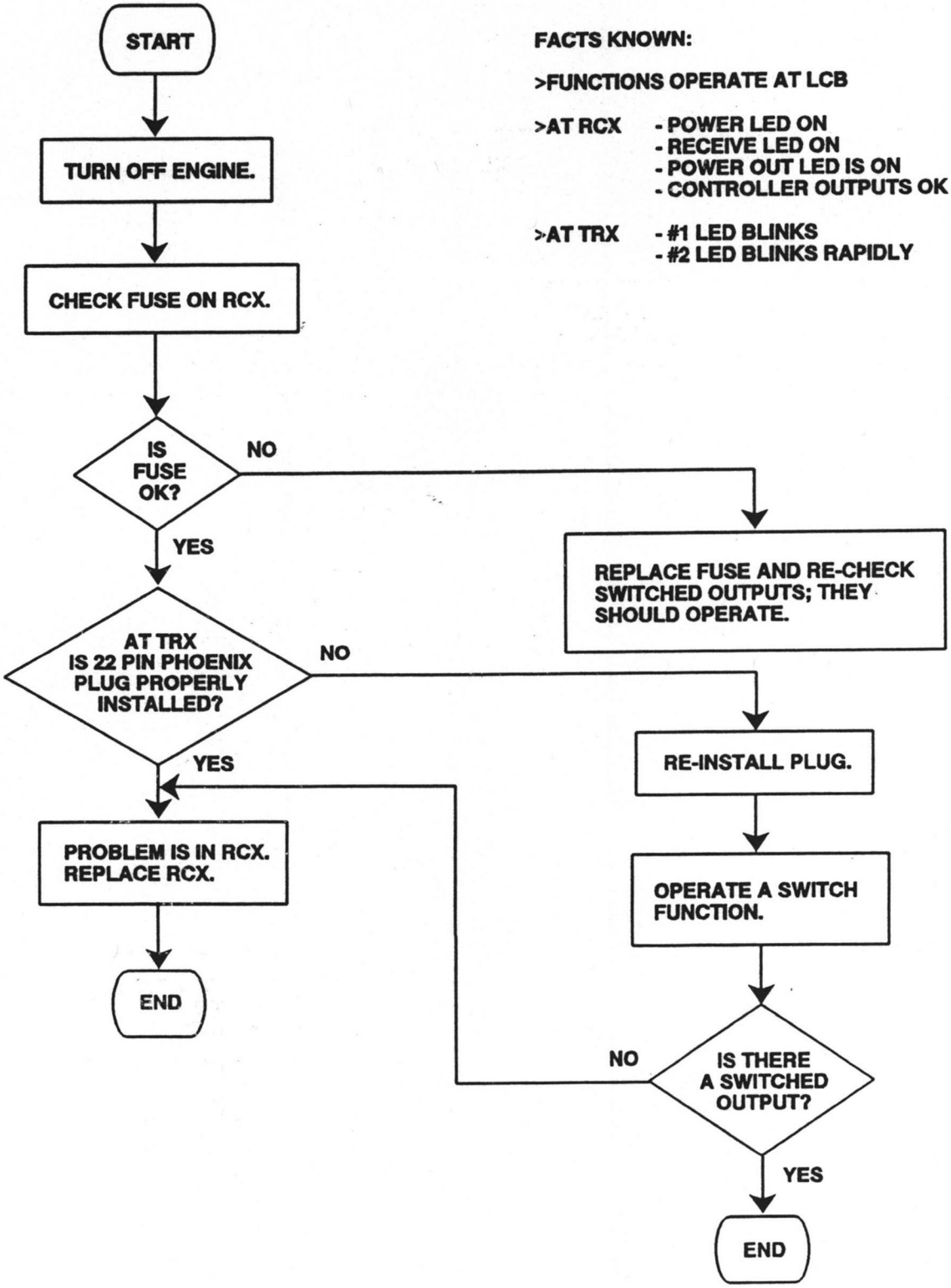
PROBLEM #3: ONE SWITCHED OUTPUT NOT FUNCTIONING (PAGE 4 of 5) 07/02/92



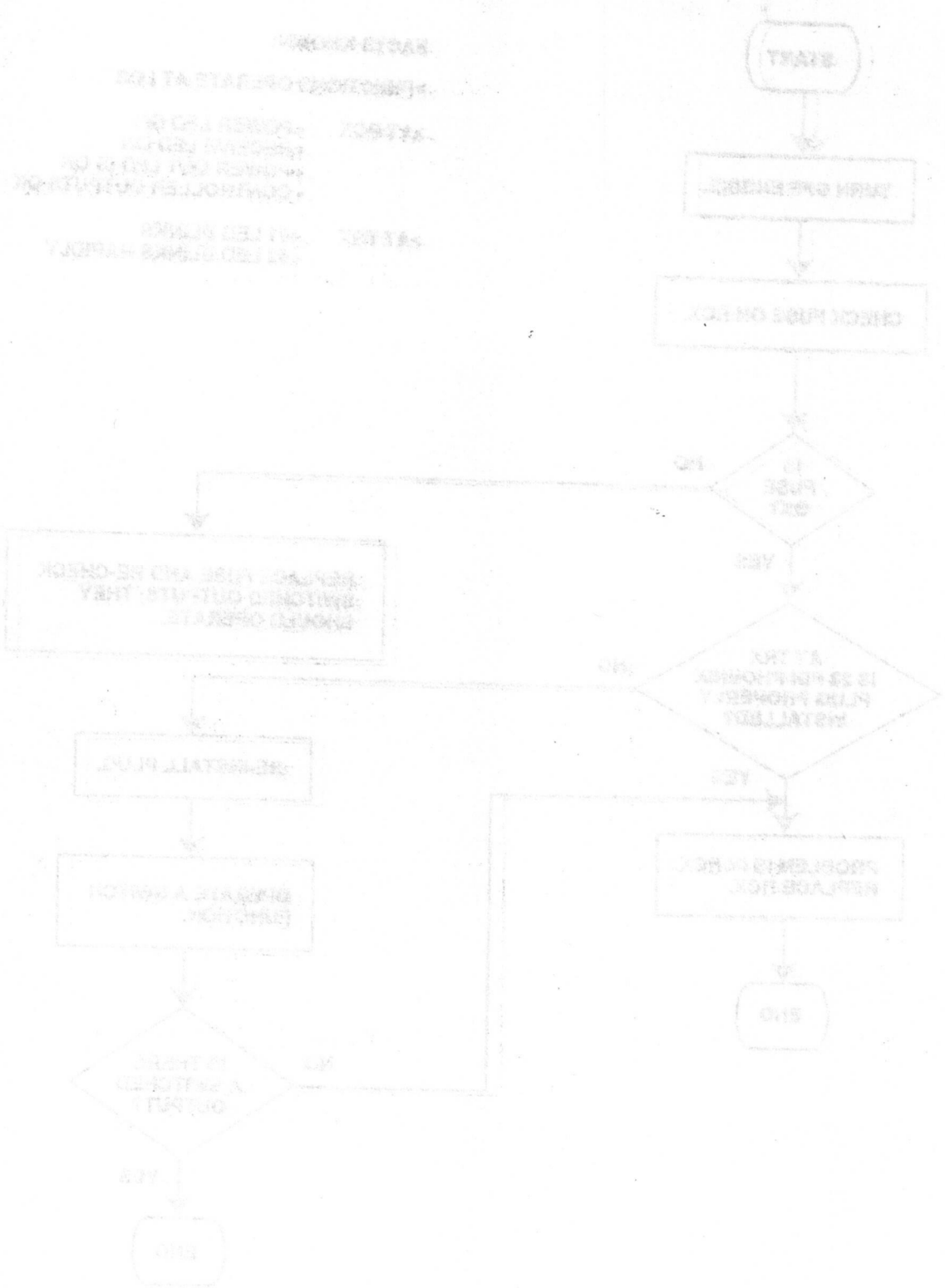
PROBLEM #3: ONE SWITCHED OUTPUT NOT FUNCTIONING (PAGE 5 OF 5) 07/02/92



PROBLEM #4: ALL SWITCHED OUTPUTS NOT FUNCTIONING (PAGE 1 OF 1) 4/30/92



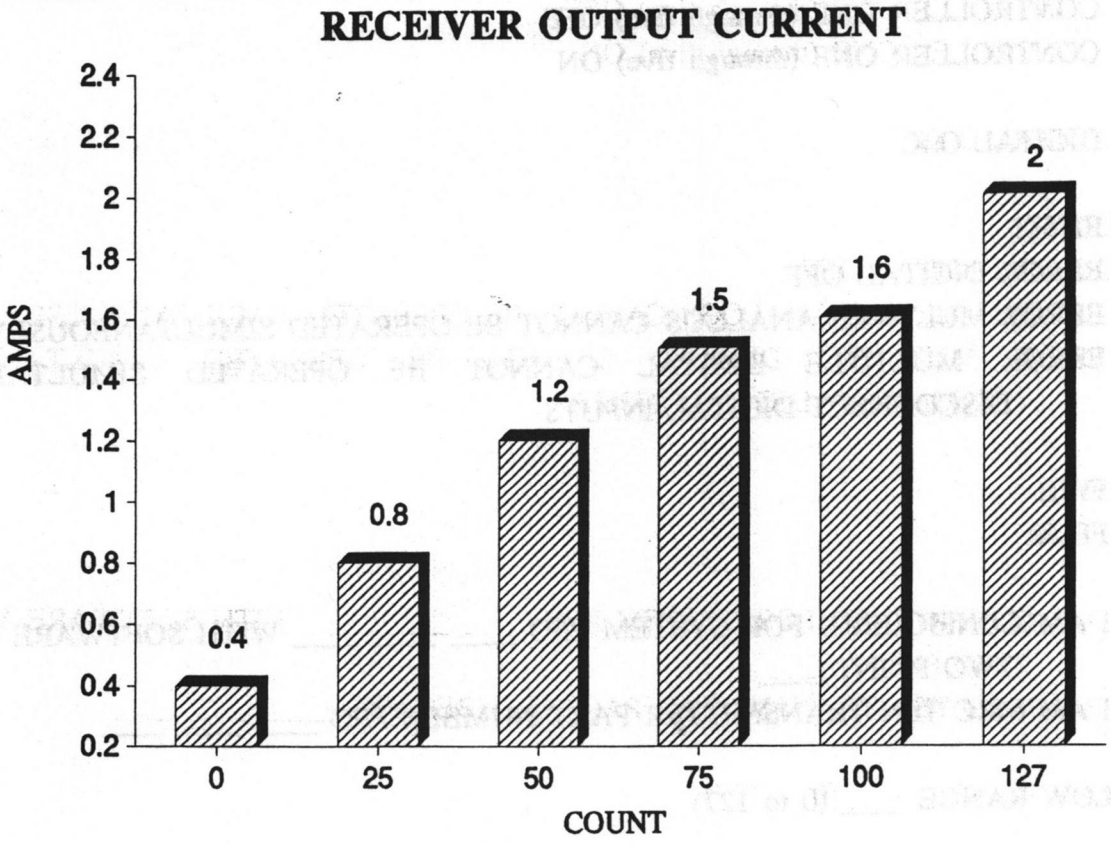
APPENDIX I



APPENDIX II

RECEIVER OUTPUT CURRENT
VS.
CONTROLLER SETTING VALUES/OPERATING OUTPUT

2 Amp max Receiver



THRESHOLD AND MAX OUT CONTROLLER SETTING VALUES
(OR)
TRANSMITTED CONTROLLER OUTPUT VALUE, TEST MODE,
PARAMETER THREE

Nominal values. Actual values may vary by up +- 7% of span.

APPENDIX III

MRC-10 WORDS & PHRASES

ANALOG INPUT NUMBER ONE (through five) RANGE ERROR
ANALOGS O.K.

CHECK ANALOGS
CHECK TWO WIRE LINK
CONTROLLER NUMBER ONE (through five) HAS BEEN OPERATED ____ HOURS
CONTROLLER ONE (through five) OFF
CONTROLLER ONE (through five) ON

DIGITAL O.K.

EIGHT
ERROR DIGITAL OFF
ERROR MULTIPLE ANALOGS CANNOT BE OPERATED SIMULTANEOUSLY
ERROR MULTIPLE DIGITAL CANNOT BE OPERATED SIMULTANEOUSLY
DISCONNECT DIGITAL INPUTS

FIVE
FOUR

I AM CONFIGURED FOR SYSTEM PFO ____ ____ ____ WITH SOFTWARE VERSION
TWO POINT ____
I AM MRC TEN TRANSMITTER PART NUMBER PFO ____ ____ ____

LOW RANGE ____ (0 to 127)

MAX LEVER ____ (0 to 127)
MAX OUT ____ (0 to 127)
MODE IS ACTIVE SETUP - PARAMETER IS ____
MODE IS MRC TEN DATA - PARAMETER IS ____
MODE IS RUN - PARAMETER IS ____
MODE IS SELECT - PARAMETER IS ____
MODE IS SPECIAL NUMBER ____
MODE IS STATIC SETUP - PARAMETER IS ____
MODE IS TEST - PARAMETER IS ____
MRC TEN O.K.

NINE
NOT USED
ONE
OUTPUT LEVEL ____

RAMP UP ____.____ SECONDS
RAMP DOWN ____.____ SECONDS

SEVEN
SIX
SWITCHED INPUT ____ (1 through 21) OFF
SWITCHED INPUT ____ (1 through 21) ON
SWITCHED INPUT ____ (1 through 21) HAS BEEN OPERATED ____ HOURS
SYSTEM FLAG ____ (0 through 4) ____ (on/off)

THE SUPPLY VOLTAGE IS ____.____ VOLTS
THE TOTAL CONTROLLER OPERATING TIME IS ____ HOURS
THE MRC TEN HAS BEEN OPERATED A TOTAL OF ____ HOURS
THIS APPLICATION USES ____ (1 through 21) SWITCHED INPUTS AND
____ (1 through 21) SWITCHED OUTPUTS
THIS APPLICATION USES ____ (1 through 5) CONTROLLER INPUTS

THREE
THRESHOLD ____ (1 through 127)
TO MAKE CONTROLLER OPERATIONAL REVERSE WIRES TO ONE (through five) A AND ONE (through 5) B
TOTAL OF ____ SYSTEM ERROR ____ (0 through 4)

TWO
TWO ANALOGS CANNOT BE OPERATED AT THE SAME TIME DURING THIS ADJUSTMENT
TWO WIRE DATE LINK NOT CONNECTED CHECK F AND G TERMINAL WIRING
TWO WIRE DATA LINK O.K.
TWO WIRE LINK O.K.

WARNING LOW BATTERY

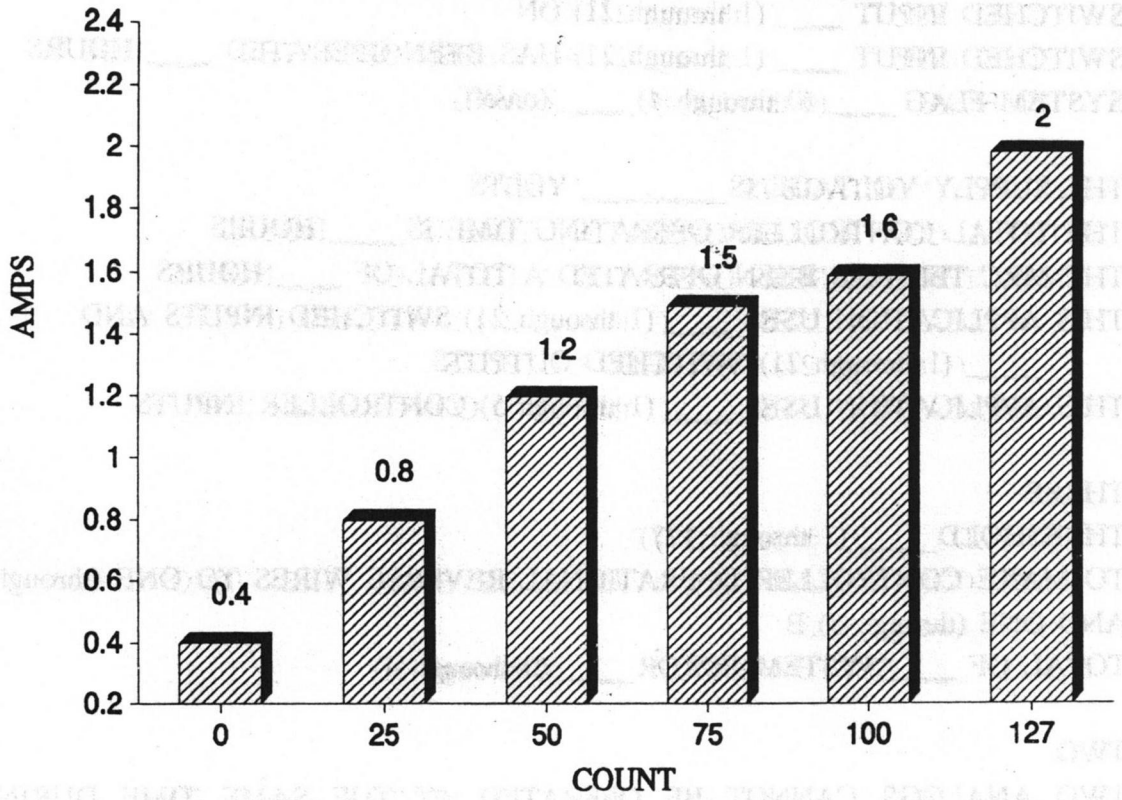
ZERO

APPENDIX II

RECEIVER OUTPUT CURRENT
VS.
CONTROLLER SETTING VALUES/OPERATING OUTPUT

2 Amp max Receiver

RECEIVER OUTPUT CURRENT



THRESHOLD AND MAX OUT CONTROLLER SETTING VALUES
(OR)
TRANSMITTED CONTROLLER OUTPUT VALUE, TEST MODE,
PARAMETER THREE

Nominal values. Actual values may vary by up +- 7% of span.

APPENDIX III
MRC-10 WORDS & PHRASES

ANALOG INPUT NUMBER ONE (through five) RANGE ERROR
ANALOGS O.K.

CHECK ANALOGS
CHECK TWO WIRE LINK
CONTROLLER NUMBER ONE (through five) HAS BEEN OPERATED ____ HOURS
CONTROLLER ONE (through five) OFF
CONTROLLER ONE (through five) ON

DIGITAL O.K.

EIGHT
ERROR DIGITAL OFF
ERROR MULTIPLE ANALOGS CANNOT BE OPERATED SIMULTANEOUSLY
ERROR MULTIPLE DIGITAL CANNOT BE OPERATED SIMULTANEOUSLY
DISCONNECT DIGITAL INPUTS

FIVE
FOUR

I AM CONFIGURED FOR SYSTEM PFO ____ ____ ____ WITH SOFTWARE VERSION
TWO POINT ____
I AM MRC TEN TRANSMITTER PART NUMBER PFO ____ ____ ____

LOW RANGE ____ (0 to 127)

MAX LEVER ____ (0 to 127)
MAX OUT ____ (0 to 127)
MODE IS ACTIVE SETUP - PARAMETER IS ____
MODE IS MRC TEN DATA - PARAMETER IS ____
MODE IS RUN - PARAMETER IS ____
MODE IS SELECT - PARAMETER IS ____
MODE IS SPECIAL NUMBER ____
MODE IS STATIC SETUP - PARAMETER IS ____
MODE IS TEST - PARAMETER IS ____
MRC TEN O.K.

NINE
NOT USED
ONE
OUTPUT LEVEL ____

RAMP UP ____.____ SECONDS
RAMP DOWN ____.____ SECONDS

SEVEN
SIX
SWITCHED INPUT ____ (1 through 21) OFF
SWITCHED INPUT ____ (1 through 21) ON
SWITCHED INPUT ____ (1 through 21) HAS BEEN OPERATED ____ HOURS
SYSTEM FLAG ____ (0 through 4) ____ (on/off)

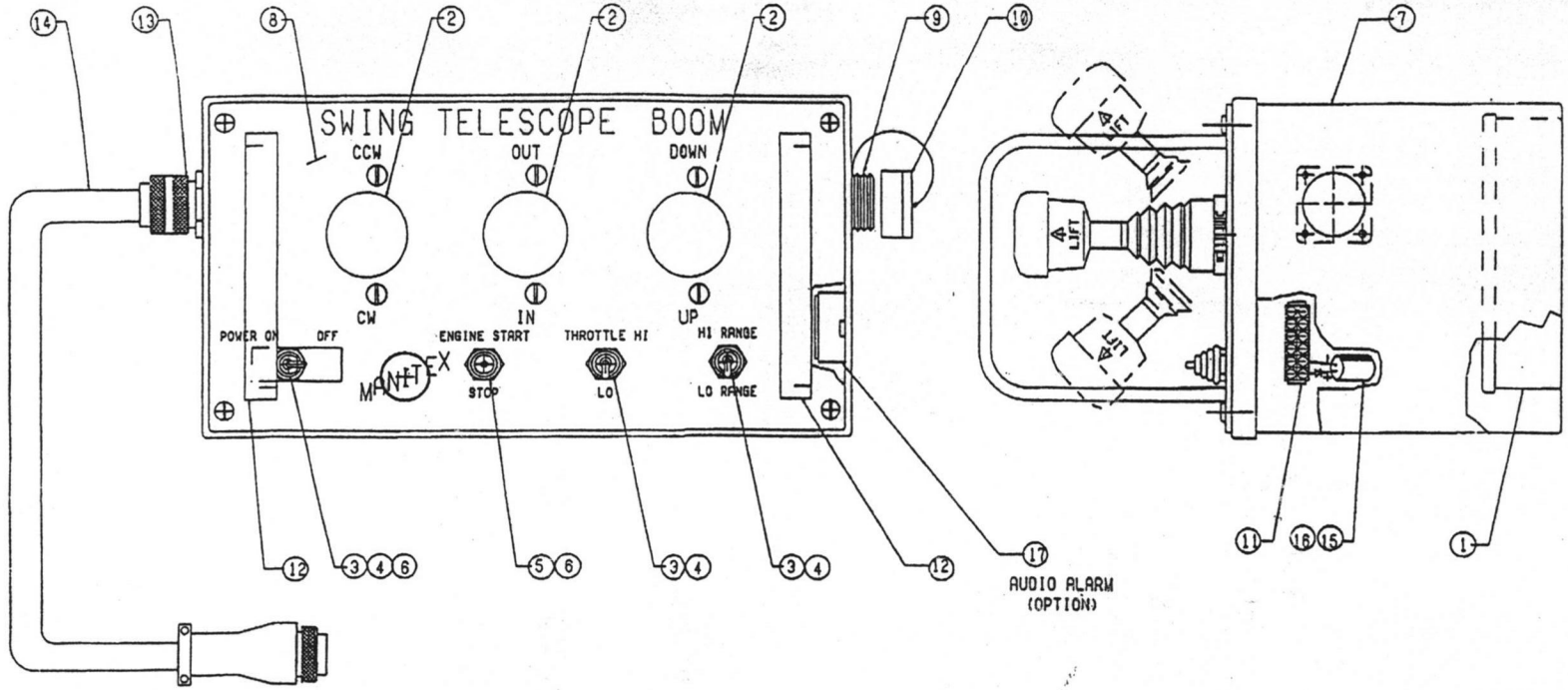
THE SUPPLY VOLTAGE IS ____.____ VOLTS
THE TOTAL CONTROLLER OPERATING TIME IS ____ HOURS
THE MRC TEN HAS BEEN OPERATED A TOTAL OF ____ HOURS
THIS APPLICATION USES ____ (1 through 21) SWITCHED INPUTS AND
____ (1 through 21) SWITCHED OUTPUTS
THIS APPLICATION USES ____ (1 through 5) CONTROLLER INPUTS

THREE
THRESHOLD ____ (1 through 127)
TO MAKE CONTROLLER OPERATIONAL REVERSE WIRES TO ONE (through five) A AND ONE (through 5) B
TOTAL OF ____ SYSTEM ERROR ____ (0 through 4)

TWO
TWO ANALOGS CANNOT BE OPERATED AT THE SAME TIME DURING THIS ADJUSTMENT
TWO WIRE DATE LINK NOT CONNECTED CHECK F AND G TERMINAL WIRING
TWO WIRE DATA LINK O.K.
TWO WIRE LINK O.K.

WARNING LOW BATTERY

ZERO



REVISIONS

MANITEX P/N	DESCRIPTION
4800440-531	CAP HANDLE ASSY CONSISTS OF: QTY ITEM P/N 1 UPPER CAP HANDLE A116 1 HANDLE SPRING A117 1 LOWER CAP HANDLE A115 1 RETAINING RING A118
4800440-532	BOOT ASSY CONSISTS OF: QTY ITEM P/N 1 BOOT A346 1 BOOT CLAMP A130

Item	Quan.	Part No.	Description	MANITEX PART Nº
1	1	PFO458-2TR	MRC-10 TRANSMITTER RFI PROTECTION	4800440-501
2	3	PMS4M7014	PFMS4 CONTROLLER W/MECH INTERLOCK	-502
3	3	EPFO-148	MAINTAINED DPST TOGGLE SWITCH	-503
4	4	EPRS-785	BOOT FOR TOGGLE SWITCH	
5	1	EPFO-150	MOMENTARY DPST TOGGLE SWITCH	
6	1	EPRS-784	SWITCH GUARD	-504
7	1		ENCLOSURE MOD. (SEE DWG)	-505
8	1		NAMEPLATE (SEE DWG)	-506
9	1	EPCN-837	MS WALL CONNECTOR MS3102E20-27S	-507
10	1	EPCN-832	MS COVER & CAP MS25043-20D	-508
11	1	BB-31	6 POLE TERMAINAL STRIP	-509
12	2		SIDE GUARDS (SEE DWG)	-510
13	1	EPFO-011	1/2" HUBBEL CONNECTOR	
14	1	PF0458-2C2	10FT P.A.T 7 COND. DOUBLE SHIELD CABLE WITH MS 7 PIN CONNECTOR MS3106F16S-1P	-511
15	1	EPCA-563	2200UF 35V CAPACITOR	-512
16	1		1" LG DOUBLE SIDE TAPE	-513
17	OPTION	EPFO-301 (See Note)	XL-600 AUDIO ALARM	-514
18	1	EPCR-309	DIODE GE-1N5624	-515
19	1		4.7K 2% 1/2 WATT RESISTOR	4800440-516

Manitex Inc.
A SUBSIDIARY OF THE MANITOWOC COMPANY, INC.

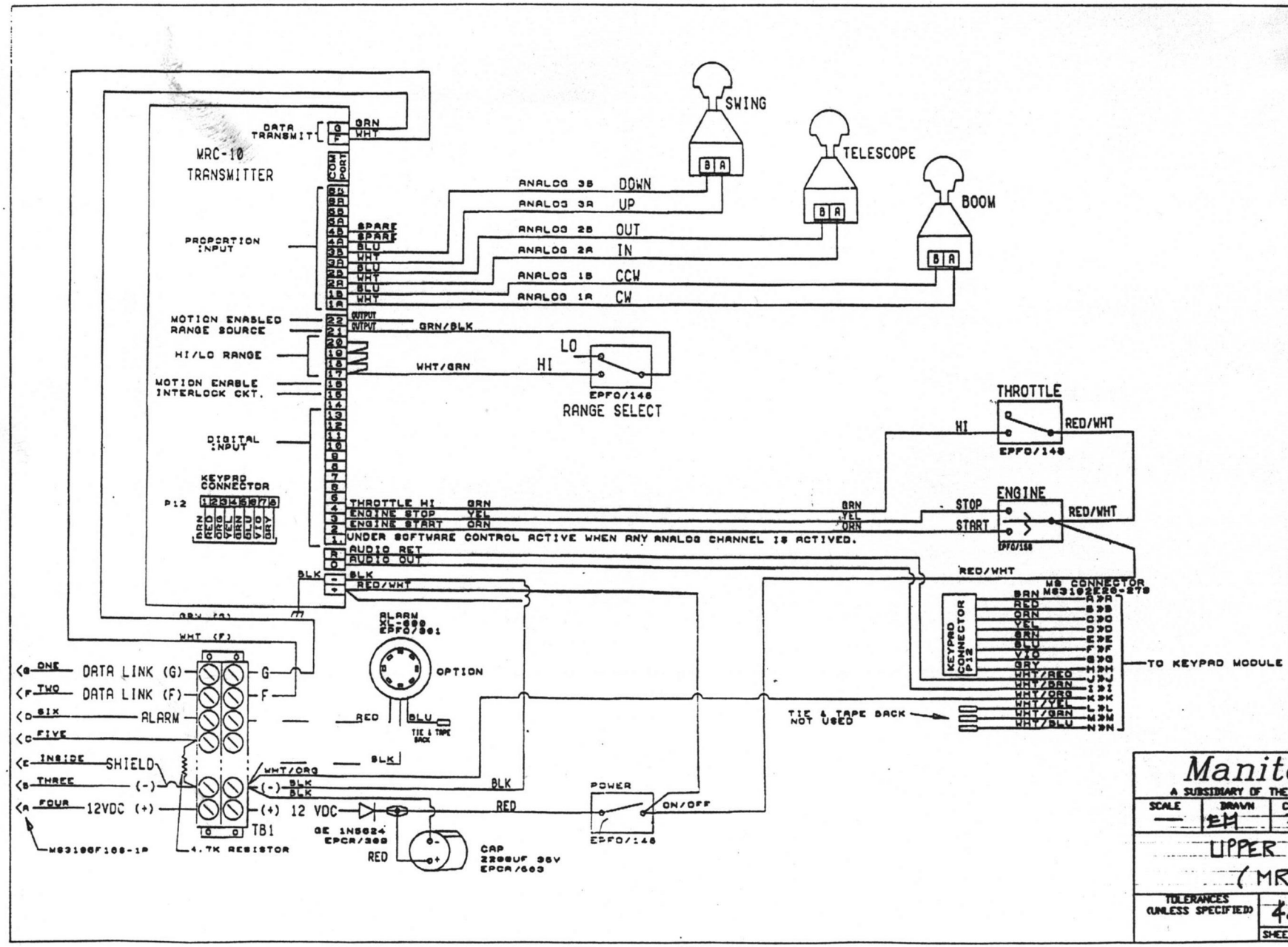
SCALE	DRAWN	CHECKED	APPVD/DATE
—	EM	DO	12-10-91

UPPER STATION
(MRC 10)

TOLERANCES (UNLESS SPECIFIED)

4800440-001

SHEET OF 2



REVISIONS

Manitex Inc.

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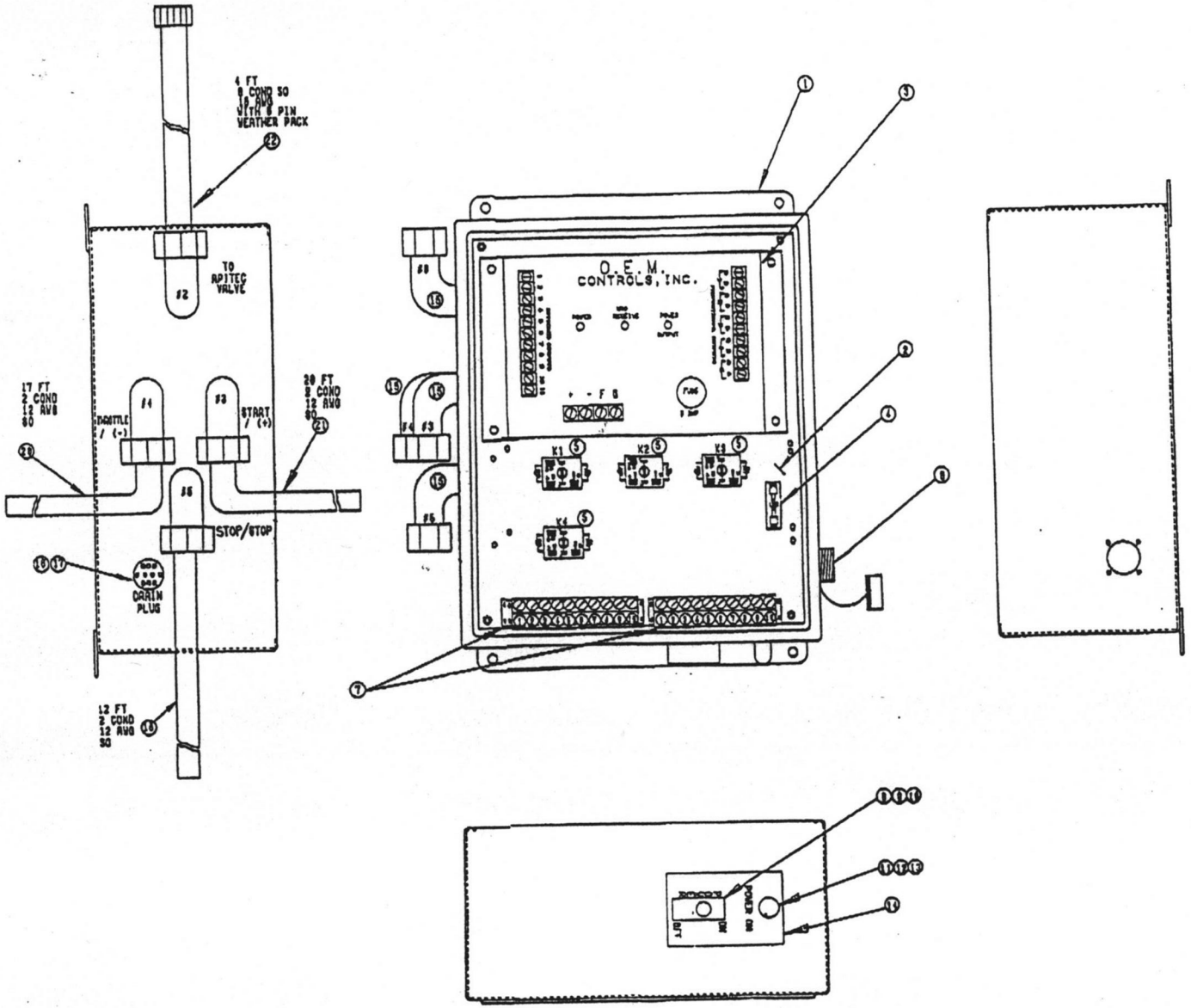
SCALE	DRAWN	CHECKED	APPVD./DATE
—	EM	DO	12-9-91

UPPER STATION
(MRC 10)

TOLERANCES (UNLESS SPECIFIED)

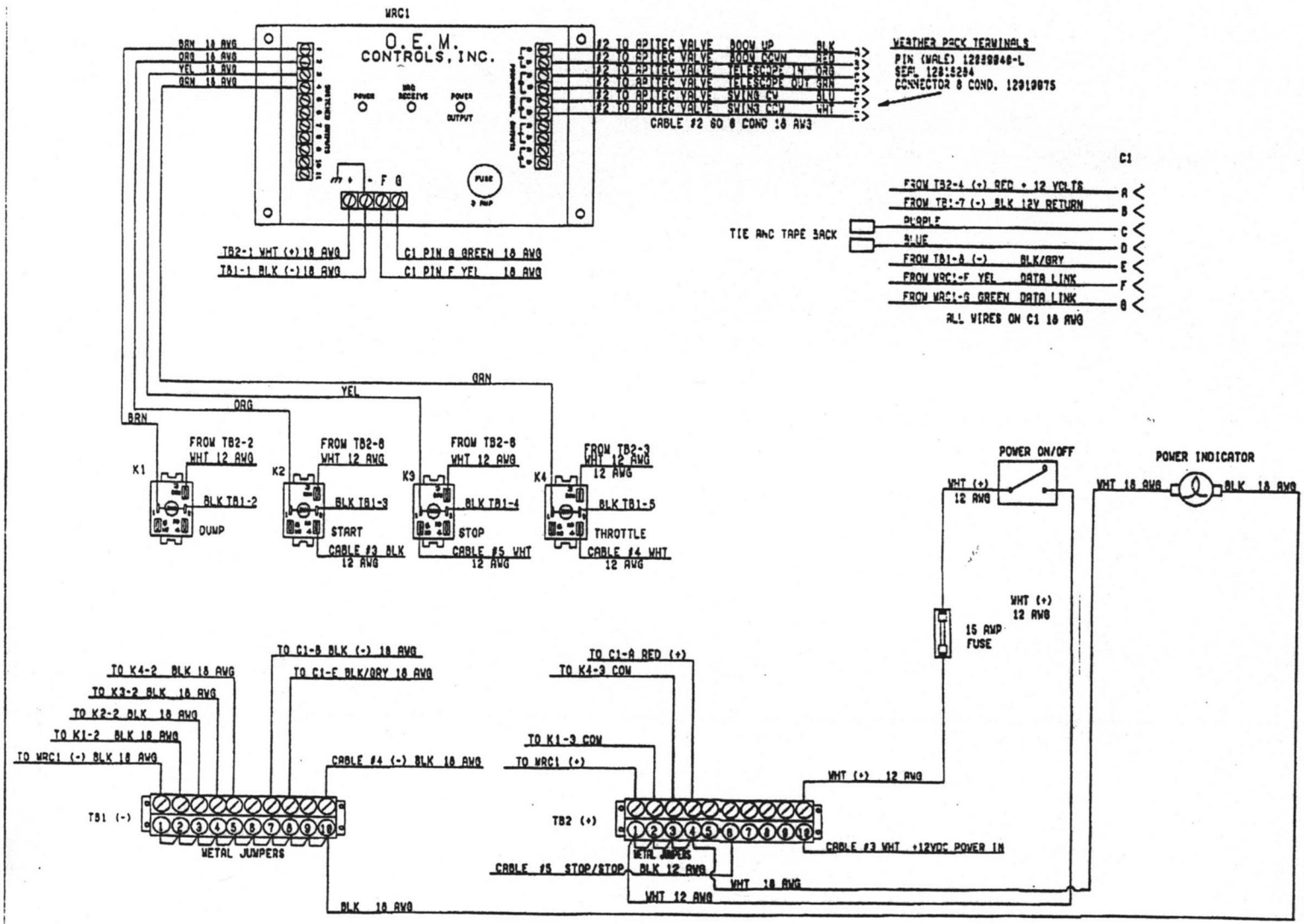
4800440-001

SHEET 2 OF 2



REVISIONS

Manitex Inc. A SUBSIDIARY OF THE MANITOWOC COMPANY, INC.			
SCALE —	DRAWN EFT	CHECKED DO	APPVD/DATE 12-11-91
LOWER STATION (MRC 10)			
TOLERANCES (UNLESS SPECIFIED)	4800440-002		
	SHEET	OF 3	



REVISIONS

Manitex Inc.
A SUBSIDIARY OF THE MANITOVOC COMPANY, INC.

SCALE	DRAWN	CHECKED	APPVD/DATE
—	EM	DO	12-11-91

LOWER STATION
(MRC 10)

TOLERANCES UNLESS SPECIFIED

4800440-002

SHEET 2 OF 3

Item	Quan.	Part No.	Description	MANITEX PART NO.
1	1	EPFO-240	ENCLOSURE 14X12X6 NEMA 4	4800440-520
2	1		SUB PANEL (SEE DWG)	-521
3	1	MRE-2D27B-52A1-J	MRC-1 RECIEVER	-522
4	1	EPEH-700	FUSE HOLDER	-523
5	4		OMRON RELAY SPDT 12 VDC G4B-112TC-US-DC12	-533
6	1		7 PIN MS WALL MOUNT MS3106A16-1S	-524
7	2	BB-63	10 POLE TERMINAL STRIP	-525
8	1	EPRS-785	BOOT FOR TOGGLE SWITCH	
9	1	EPFO-148	SPDT MAINTAIN TOGGLE SW.	
10	1	EPRS-784	SWITCH GUARD	-506
11	1	EPFO-038	DIALIGHT LAMP BASE	
12	1	EPFO-035	SYLVANIA BULB #1812	
13	1	EPFO-036	DIALIGHT GREEN LENS CAP	
14	1		NAMEPLATE (B063-3654-33)	-526
15	4		3/4" 90 HUBBELL NHC - 1036	-527
16	1	EPFO-248	DRAIN PLUG	-528
17	1	EPFO-247	DRAIN PLUG COVER	-529
18	1		12 FT OF SO 12 AWG 2 COND CABLE	
19	1		9 FT OF SO 16 AWG 2 COND CABLE	
20	1		17 FT OF SO 12 AWG 2 COND CABLE	
21	1		20 FT OF SO 12 AWG 2 COND CABLE	
22	1		4 FT OF SO 18 AWG 6 COND CABLE WITH WEATHER PACK CONNECTOR /MALE PINS & SEALS.	
23	1	EPEH-818	15 AMPS FUSE	
24	1		MS PROTECTIVE COVER MS25042-16D	-530

REVISIONS

Manitex Inc.

A SUBSIDIARY OF THE MANITOWOC COMPANY, INC.

SCALE	DRAWN	CHECKED	APPVD./DATE
—	EM	PO	12-11-91

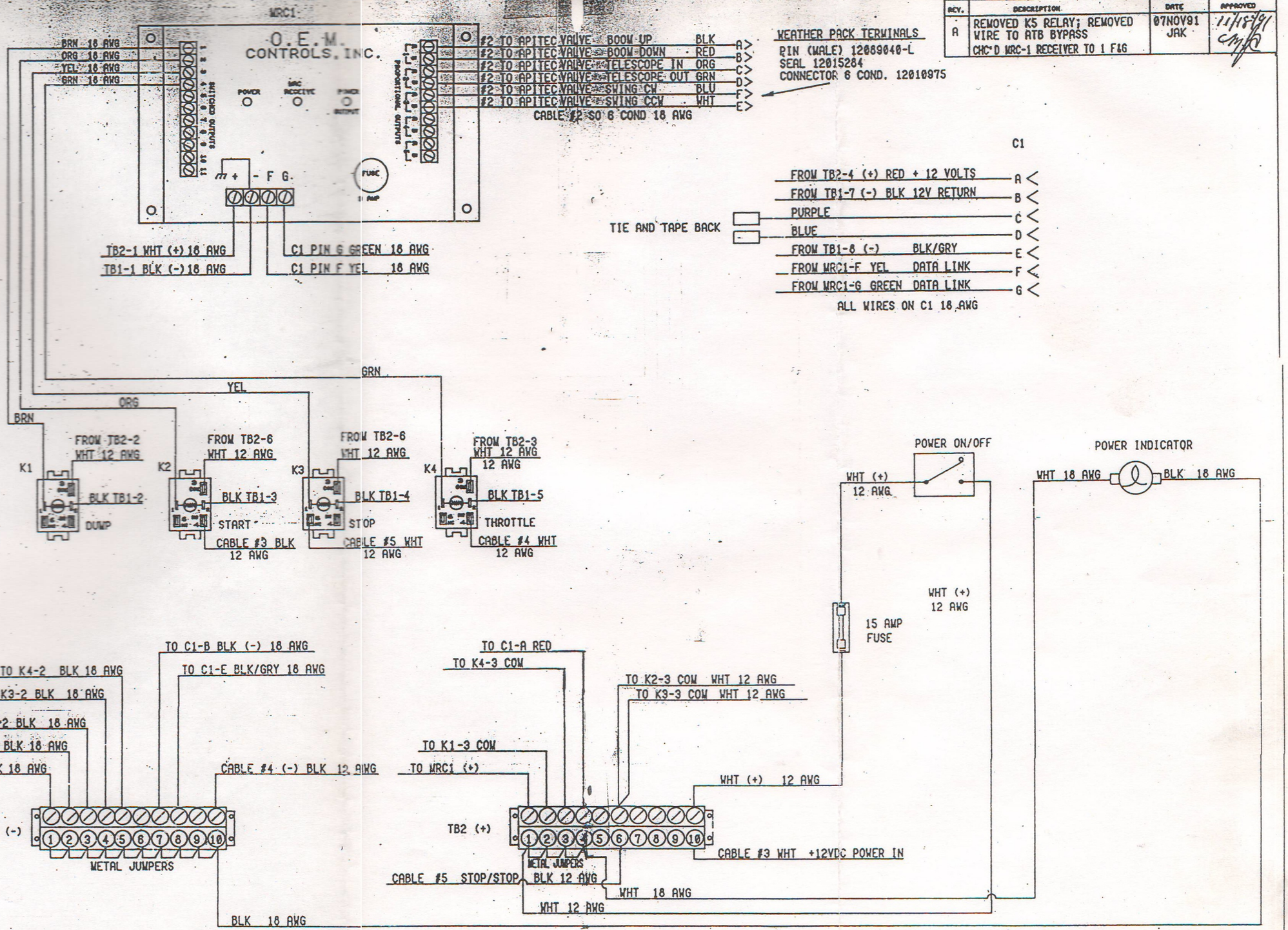
LOWER STATION
(MRC 10)

TOLERANCES (UNLESS SPECIFIED)

4800440-002

SHEET 3 OF 3

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	REMOVED K5 RELAY; REMOVED WIRE TO ATB BYPASS CHG'D WRC-1 RECEIVER TO 1 FIG	07NOV91 JAK	11/8/91



VALVE MANUFACTURER: ENERPAC
VALVE VOLTAGE: 12 VOLTS DC
COIL ARRANGEMENT: DUAL
VALVE RESISTANCE: 28 OHMS
THRESHOLD CURRENT: 40 %
SET MAX CURRENT: 100 %

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES XX°	APPROVALS	DATE
MATERIAL	DRAWN WJC	7/3/91
FINISH	CHECKED	7/8/91
DO NOT SCALE DRAWING	ISSUED	

OEM CONTROLS, INC. SHELTON, CONNECTICUT 06484

WIRING DIAGRAM
PF0458-1LS WANITEX

SIZE	FSCM NO.	DWG. NO.	REV.
		C103-3612-33	A

SCALE SHEET

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	CHANGE INPUT CABLE FROM 6 COND. TO 4 COND.	5/2/91 MJC	MJC
B	REMOVE WIRE FROM + TO DIG.5 ADDED DIODE & ALARM	10/11/91 MJC	11/18/91

MRC-10
TRANSMITTER

DATA TRANSMIT: G GRN, F WHT

COM PORT

PROPORTION INPUT

6B	SPARE	
6A	SPARE	
5B	BLU	ANALOG 3B CCW
5A	WHT	ANALOG 3A CW
4B	BLU	ANALOG 2B OUT
4A	WHT	ANALOG 2A IN
3B	BLU	ANALOG 1B DOWN
3A	WHT	ANALOG 1A UP

SWING, TELESCOPE, BOOM — B A

22	OUTPUT	MOTION ENABLED
21	OUTPUT	RANGE SOURCE — GRN/BLK
20		HI/LO RANGE
19		
18		
17		WHT/GRN
16		MOTION ENABLE INTERLOCK CKT.
15		
14		
13		DIGITAL INPUT
12		
11		
10		
9		
8		
7		KEYPAD CONNECTOR
6		
5	THROTTLE HI	GRN
4	ENGINE STOP	YEL
3	ENGINE START	ORN
2		
1	UNDER SOFTWARE CONTROL ACTIVE WHEN ANY ANALOG CHANNEL IS ACTIVED.	
R	AUDIO RET	
O	AUDIO OUT	
-	BLK	BLK
+	RED/WHT	RED/WHT

P12: 1 BRN, 2 RED, 3 ORG, 4 YEL, 5 GRN, 6 BLU, 7 VIO, 8 GRY

RANGE SELECT: LO / HI — EPFO/148

THROTTLE: HI — RED/WHT — EPFO/148

ENGINE: STOP — START — RED/WHT — EPFO/150

RED/WHT

MS CONNECTOR MS3102E20-27S

KEYPAD CONNECTOR P12

BRN	A	A
RED	B	B
ORN	C	C
YEL	D	D
GRN	E	E
BLU	F	F
VIO	G	G
GRY	H	H
WHT/RED	J	J
WHT/BRN	I	I
WHT/ORG	K	K
WHT/YEL	L	L
WHT/GRN	M	M
WHT/BLU	N	N

TO KEYPAD MODULE

TIE & TAPE BACK NOT USED

GRN (G)

WHT (F)

ALARM XL-600 EPFO/301 — OPTION — RED — BLU — TIE & TAPE BACK — BLK

TB1

G	ONE	DATA LINK (G)
F	TWO	DATA LINK (F)
D	SIX	ALARM
C	FIVE	
E	INSIDE	SHIELD
B	THREE	(-)
A	FOUR	12VDC (+)

MS3106F16S-1P

4.7K RESISTOR

WHT/ORG

(-) BLK BLK

(+) 12 VDC — GE 1N5624 EPCR/300 — RED

CAP 2200UF 35V EPCA/563

POWER — ON/OFF — EPFO/148

BLK

RED

OEM CONTROLS, INC. SHELTON, CONNECTICUT 06484

APPROVALS		DATE
DRAWN	MJC	6/26/91
CHECKED	MJC	6/27/91
ISSUED		

MRC-10 TRANSMITTER
MANITEX INC. PF0458-1US

SIZE	FSCM NO.	DWG. NO.	REV.
		B103-3611-33	B

SCALE — SHEET